

THEN & NOW

NOW: A ship's electronic chart display and information system (ECDIS) gives its position, course, speed, and many other vital pieces of information to its crew. The ECDIS even tells the crew where other ships are in relation to theirs.

THEN: A marine chronometer is a very accurate timepiece that sailors used to determine what time it was on shore. In the days before electronic instruments, knowing the time was crucial for navigating. Chronometers were made in special cases that "floated" them on rotating pieces, so that they wouldn't be affected by the rolling waves.



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WHAT'S THE SAME?

Even though most ships use computers to navigate, many are still required to have an old-fashioned marine chronometer and other navigation tools on board. If the ship's computers break or something goes wrong with the system, the crew can use their analog equipment to find their way back to port.

WHAT'S CHANGED?

A sailor in the 19th century trying to find his longitude would have used two different pieces of equipment and done the equations by hand. But a ship's ECDIS can give a sailor today her precise longitude continuously.



VISIT...

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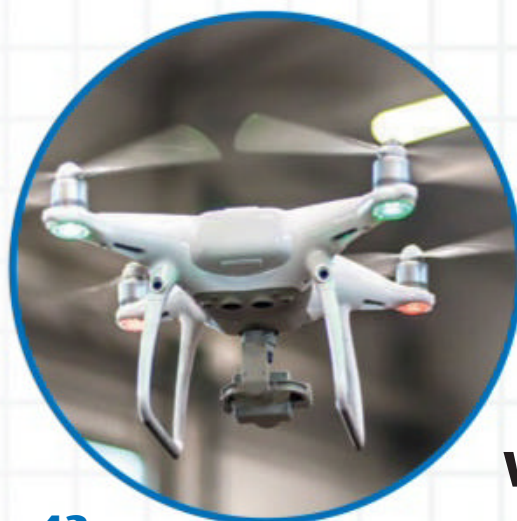
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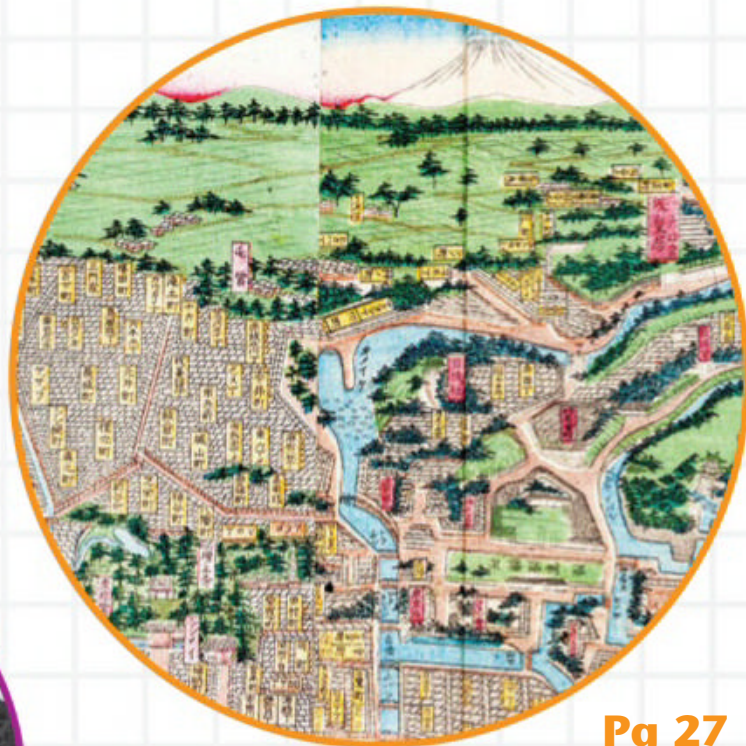
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THANK YOU!

It is with joy and sadness that I write this note to all DIG subscribers. I retired as the editor of DIG in February of this year. I have so enjoyed the 40 years since I founded the magazine with my husband. There were many twists and turns through the years — all devoted to making each issue the best possible. The original name *CLASSICAL CALLIOPE* was shortened to *CALLIOPE* and, just a few years ago, the two magazines I edited, *CALLIOPE* and *DIG*, merged into the present *DIG Into History*. Through all the changes, our mission never changed: offering readers an unbiased look at world history and archaeology through the eyes of authors who are experts in their various fields and could present unbiased, accurate, and up-to-date information that was, at the same time, engaging and exciting for readers. *DIG* was most fortunate to have had the best people in the various fields willing to write for the issues. I cannot express how grateful I am to them all and just how much I enjoyed the entire experience. The numerous awards for excellence that *CALLIOPE*, *DIG*, and *DIG Into History* have won through the years, including, most recently, the Parents' Choice Gold Award for 2018, pale in comparison to the fun I have had researching, compiling, drafting, and editing each issue.

My sadness results from learning that the company will no longer publish *DIG*. I am at a loss as to what to say to you, *DIG* readers. I do hope you have kept your issues and will refer to them from time to time. I know I have every issue of all the magazines right on shelves in my workroom.

This final issue on the history of cartography matches *DIG*'s mission. Its aim is to take you around the world, peeking in at moments in history when mapmakers sought to explain and define the world as they saw it.

Thank you all for being with me on this terrific journey!

Rosalie F. Baker

— Rosalie F. Baker, Editor

ABOUT THE COVER

Maps don't just tell you how to get around, they also tell you about the place and time they were made in. This map of Southern Italy is from the 16th century—the beautiful illustration and bright colors show that the artist Ignazio Danti had a rich patron.

NOTE: In this issue on the 1860s, we are using the abbreviations B.C.E. (Before the Common Era) and C.E. (Common Era) and not B.C. and A.D. B.C.E. and C.E. are used presently worldwide and have no religious affiliation.

MUSINGS

illustration by Tim Oliphant



A good traveler has no fixed plans.

—Lao Tzu, Chinese philosopher who lived around 6th century B.C.E.

MY FRIENDS
AND I HAVE HAD
A GREAT TIME
EXPLORING WITH
YOU. ON TO THE
NEXT ADVENTURE!

CAN YOU
FIND THE
"EAGLE EYE"
HIDDEN IN THIS
ISSUE?



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Gerardus Mercator and Jodocus Hondius (left and right, respectively) were two of the most famous mapmakers of the 15th and 17th centuries.



GERARDUS MERCATOR NATUS
RUPELMUNDÆ III NON. MARTII ANNO
CIDI XII: VIXIT ANN. LXXXII. M. VIII. D.
XXVI: DENATUS IV NON. DECEMBRIS
ANNO CIDI XCIV.

IUDOCUS HONDIUS NATUS IN
PAGO FLANDRIÆ DICTO WACKENE XVI
KALEND. NOVEMBRIS ANNO CIDI LXIII:
VIXIT ANN. XLVII. M. VII. D. XXIX: DENAT:
US XIV KAL. MARTII ANNO CIDI CXII.

In the Beginning

by Patrick Wertmann

What would you do if you had invited friends to your house and they asked you for directions? Well, you could draw a map!

And, if you did, you most likely would include your street and theirs, as well as the landmarks between the two, such as a school or a supermarket. Using these places on the map as markers, your friends can then plan the best route to take.

Generally speaking, a map is an illustration of the earth's surface, and a person who draws maps is called a cartographer. But how are maps made?

In prehistoric times, hunters would sometimes draw their hunting territories on cave walls. In the millennia that followed, maps would have been painted by hand on various materials, including parchment, clay, ivory, and even the hide of an animal.

Fast forward to modern times. With the invention of such tools as compasses, telescopes, and sextants, cartographers were able to define and show distances much more accurately. Today, aerial photography, satellite images, and computer software such as Geographical Information Systems (GIS) have made mapmaking even more precise. For example, mapmakers are now able to illustrate the physical features of our earth. Using satellite images, they can create three-dimensional maps that are exceptionally correct.

Do all maps show the same contents? No! There are many different types of maps. Physical maps give us views of the earth's continents, mountains, forests, and waterways. Political maps identify countries and their boundaries. Economic maps offer information about the agricultural products or minerals found in a certain region. There are also maps that detail the climate or the population density in a particular location.

Of course, there are maps that offer details other than those connected with land

masses. Nautical maps, for instance, are important tools for ship captains. They include information about the depth of the water, land formations along the coastline, navigational dangers, harbors, and bridges. They also provide data on tides and currents, as well as the earth's magnetic field.

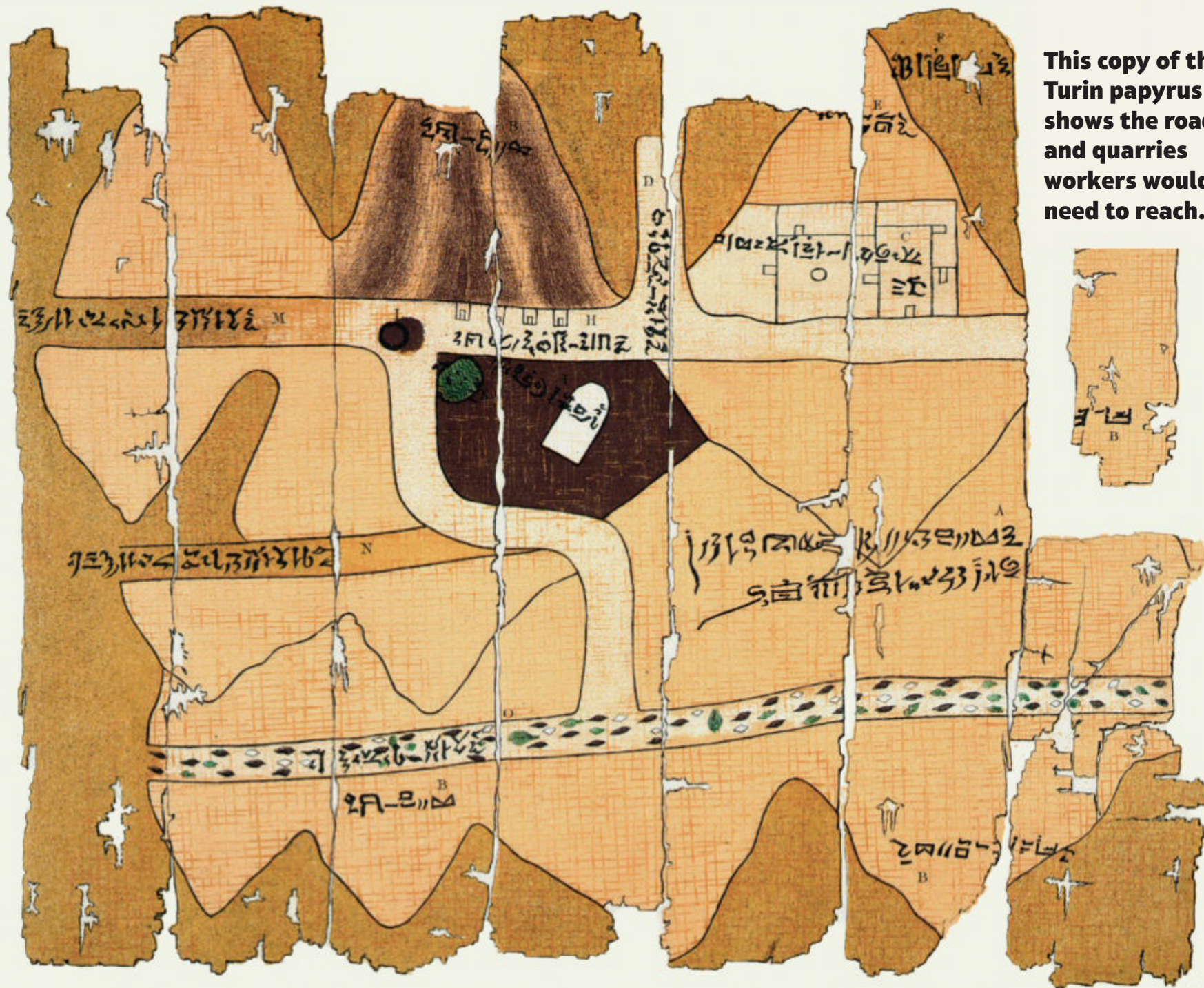
Just as nautical maps help a ship's captain, so aeronautical maps help airplane pilots to determine position and altitude, and assist ground controllers in airport towers with planning and deciding the best route to a particular destination. In emergency situations, aeronautical maps can help responders locate an alternative landing area.

Today, people who have no special map training can observe the world from above without having to leave their homes. Most likely, you have used software such as Google Earth or Google Maps. Thanks to satellite images, we can now easily spot the smallest details of our house and environment by using the Internet. Not everyone, however, is fond of these tools, because their easy access may lead to violations of privacy. Lawmakers around the world are presently addressing this issue.

Patrick Wertmann is a Sinologist and art historian living in China.

Just about everything in the world can be mapped. Different maps are specialized for different subjects!





This copy of the Turin papyrus shows the roads and quarries workers would need to reach.

The First Map?

by Paul T. Nicholson

Many maps have been labeled the “first map,” but one is generally accepted as the earliest true map. It traces its origin to ancient Egypt and is, actually, a geological map (see pages 40–41). American geologist James Harrell describes it as 29 centuries older than the next oldest known geological map!

Why ‘Turin’?

Known as the Turin Mining Papyrus, it was named after the Italian city of Turin, where it is now housed in the Egyptian Museum. It

probably belonged to the well-known antiques collector Bernardino Drovetti (1776–1852) and was sold to the museum along with other artifacts in his collection.

The map dates to the time of the 20th Dynasty Egyptian pharaoh Ramses IV (1153–1147 B.C.E.). It was made either to help his quarrying expedition find the source of what the Egyptians called **bekhen-stone** or perhaps to help his men find the pink granite that was used to make statues.





◀ **Pink granite was used in important buildings and objects, like this pink granite sarcophagus of Ramses III, from 1184–1153 B.C.E.**

What It 'Says'

The Turin papyrus might also be described as a treasure map, since it shows how to find gold! The various rocks depicted on it are shown in different colors. In an area with speckled pink rocks — representing granite — there is a note saying “The Mountains of Gold.” There is a second note that reads “the mountains in which gold is washed.” The Egyptians used this phrase used to describe the extraction of gold from the surrounding granite. By the time of Ramses IV, the mines had probably been emptied of gold. However, the pink granite, which had contained the gold, was still valued in the making of monuments. Most likely, it was this granite or the greywacke that the quarrymen sought.

In addition to showing the relationships between the various rock types, the Turin papyrus also marks a mining settlement, a small temple or shrine to “Amun of the Pure Mountain,” and roads or tracks. Even more important, it marks the location of a cistern or well, which would have been vital for providing water to a mining expedition. The map might also have been a special copy of one that had been used in the field and prepared to commemorate a successful quarrying expedition.

What is almost certain is that the Turin papyrus was drawn by Amenakhte son of Ipu, a well-known scribe who lived in the workers' village of Deir el-Medina. While he did not sign the document, his handwriting is readily recognizable today and can be distinguished from that of other scribes in the village.



This papyrus, a map of Ramses IV's tomb, probably was drawn after the tomb itself (left) was completed.

And Yet Another!

Another “first” in cartographic history is a second papyrus dating to Ramses IV's reign that shows a detailed plan of his royal tomb. It even labels the various parts of the structure. Most likely Amenakhte was responsible for this map as well! Howard Carter, who later discovered the tomb of the pharaoh Tutankhamun (better known today as King Tut), studied the plan carefully. He concluded that it may have been drawn after the completion of the tomb rather than as a guide for the overseers of quarrymen who were responsible for cutting it.

Questions Remain

Where was the place of gold noted on the Turin papyrus? How do we know that the map depicts reality? After all, at the time, there were maps that illustrated the mythological underworld. What is certain is that the map is clear enough in its depiction of the relationships between the rocks that it is possible to identify the specific area. It is the Wadi Hammamat, a valley that runs through the Eastern Desert between the Nile Valley and the Red Sea. And, the gold mines are generally agreed to be at a place that we now know as Bir Umm Fawakhir.

.....
Paul T. Nicholson is professor of archaeology at Cardiff University, U.K., and has worked on numerous archaeological expeditions to Egypt.

Ramses IV (left) was known for several enormous building projects, which required huge quarries.

How **BIG** **Is the**



BIG **Blue Marble?**

by Vaughn M. Bryant

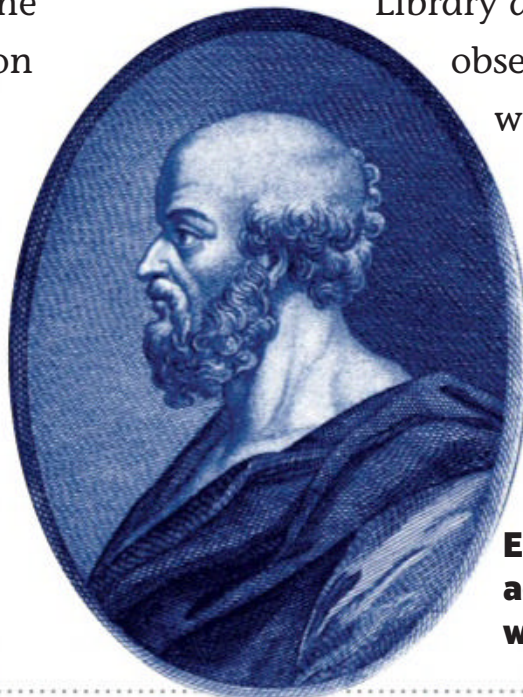
“**T**he Blue Marble” is what the crew of **Apollo 17** called the image of planet Earth taken at a distance of about 18,000 miles from the Earth’s surface. Using laser technology from satellites that we put into space, we know the exact circumference of the Earth is 24,901.55 miles around the equator and slightly shorter, around 42 miles less, around the poles. Although technically an **ellipsoid**, we still think of Earth as being round.



Apollo 17 blasted off on December 7, 1972. The crew took their famous picture (opposite) the same day, on their way to the Moon.

The shape and size of Earth were puzzling questions for our ancient ancestors. Some cultures believed the Earth was a disc or box-shaped. The Egyptians believed it was egg-shaped. Finally, around 2,500 years ago, the Greeks decided that the Earth was a round sphere. The fourth-century B.C.E. Greek philosopher Aristotle noted that the Earth had to be round because of the circular shadow it casts on the Moon during partial eclipses. No one, however, knew how “big” the world might be.

Eratosthenes of Cyrene was a mathematician, geographer, poet, and astronomer who lived between 276 and 194 B.C.E. For many years, he served as the chief librarian at the Library of Alexandria in Egypt. Today, he is



most recognized for determining, almost exactly, the circumference of the Earth. How he did it seems easy for any student of geometry today, but, in his time, it was his knowledge of both math and geography that enabled him to conduct such an accurate study.

Around 200 B.C.E., a traveler visited the Library and told Eratosthenes about a strange observation he had made. He said there was a deep well in Syene (near the present-day Aswan Dam in Egypt). At the well, the sunlight would shine all the way to the bottom at noon during the summer solstice, which was a way the local farmers used to define the season of the year.

Eratosthenes was the first person to accurately measure the Earth—all without leaving his home in Alexandria!

Apollo 17 was the last Apollo mission to land men on the moon.

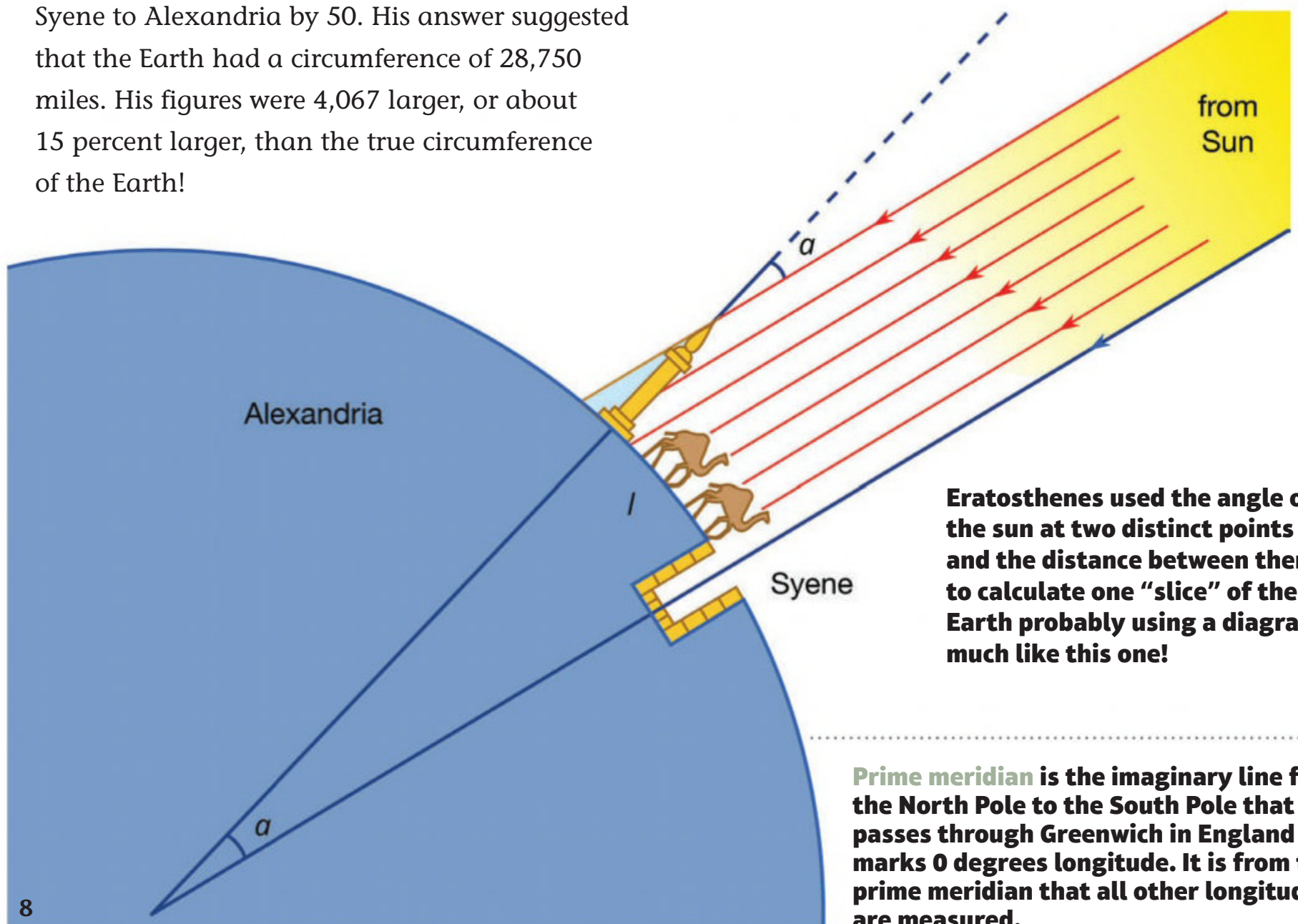
An ellipsoid is a three-dimensional geometric figure that resembles a sphere, but whose equatorial axis is slightly longer than its polar axis.

Eratosthenes believed that if he knew how long a shadow the great tower of the Alexandria Library would cast, exactly at noon during the summer solstice (the longest day of the year), he could use well and tower to calculate the size of the Earth. It really was not that difficult once he applied geometry to the problem because, if you know three parts of an equation, you can find the fourth part.

Eratosthenes knew that the sun was directly overhead at the well in Syene at noon on the summer solstice. He knew that the Egyptians had measured the distance from Syene to Alexandria at 5,000 stadia, which today would be 575 miles. He also knew that the shadow cast by the Library's tower at noon on the summer solstice was 7.2 degrees from the vertical. Using this information, he calculated the distance from Syene to Alexandria was 7.2 degrees of a sphere (the Earth) or 1/50th of a 360-degree sphere. All he then had to do was multiply the distance from Syene to Alexandria by 50. His answer suggested that the Earth had a circumference of 28,750 miles. His figures were 4,067 larger, or about 15 percent larger, than the true circumference of the Earth!

Another prominent Greek mathematician, astronomer, and geographer of the Classical world was Claudius Ptolemy, who lived between 100 and 170 C.E. in Alexandria. Today, he is best remembered for three of his most prominent works: one on astronomy, one on geography, and one on astrology. His book, *Geographia*, listed the latitude and estimated longitude coordinates for most of the known places in the Roman Empire. Although latitude could be determined fairly precisely, longitudes were only guesses. Ptolemy fixed the **prime meridian** of 0 degrees at the westernmost place of the known world, the Canary Islands. From there, his maps extended to a longitude of 180 degrees east of that point, which he believed was the center of China. The other 180 degrees of longitude in the circumstance of the world remained unknown.

Ptolemy was a skilled mapmaker, but he calculated the circumference of the earth to be only 20,692 miles. The reason for his smaller



Prime meridian is the imaginary line from the North Pole to the South Pole that passes through Greenwich in England and marks 0 degrees longitude. It is from the prime meridian that all other longitudes are measured.



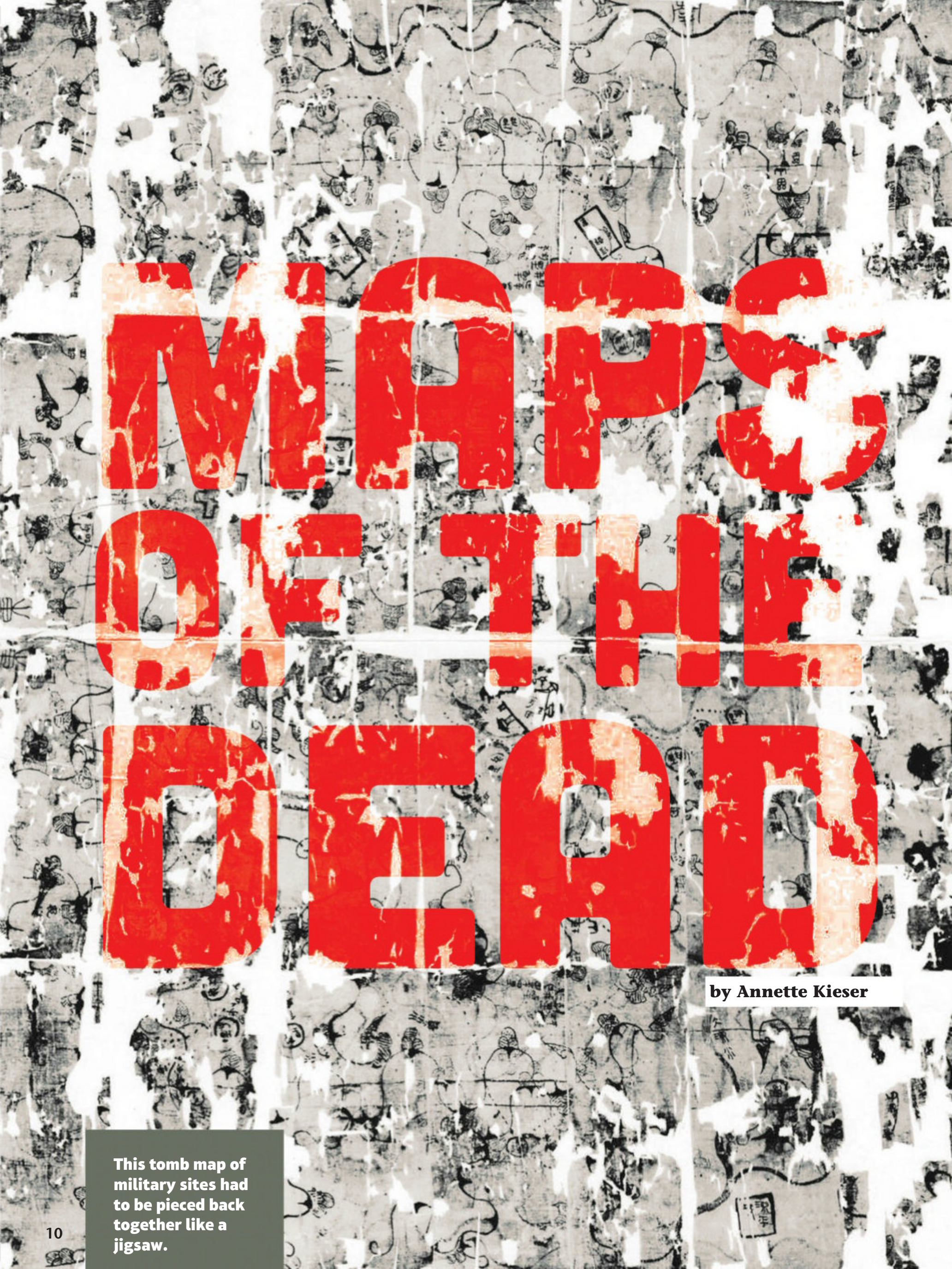
This map from 1492 shows the world as Ptolemy imagined it. Columbus likely used a map similar to this one to plan his voyage.



Christopher Columbus

circumstance of the earth was because he believed that Eratosthenes should have used 500 stadia, not 700 stadia, per degree of the world's sphere. Because Ptolemy used the smaller value of 500, his map projections were distorted. They were, however, were easier to draw and view.

Fast forward to 1492 and Christopher Columbus. Columbus wanted to believe Ptolemy's world view. If he used the smaller calculations, he felt any sailor or investor would have been willing to join or fund his expedition. By promoting the smaller view of the world, as well as his own estimates that the world was even smaller than Ptolemy has guessed, Columbus and others believed he could carry enough fresh water and food to make the long journey to China. Although his thinking was incorrect, Columbus did reach the Bahama Islands after being out of sight of land for more than a month and with his food and water almost gone.



MAPS OF THE DEAD

by Annette Kieser

This tomb map of military sites had to be pieced back together like a jigsaw.

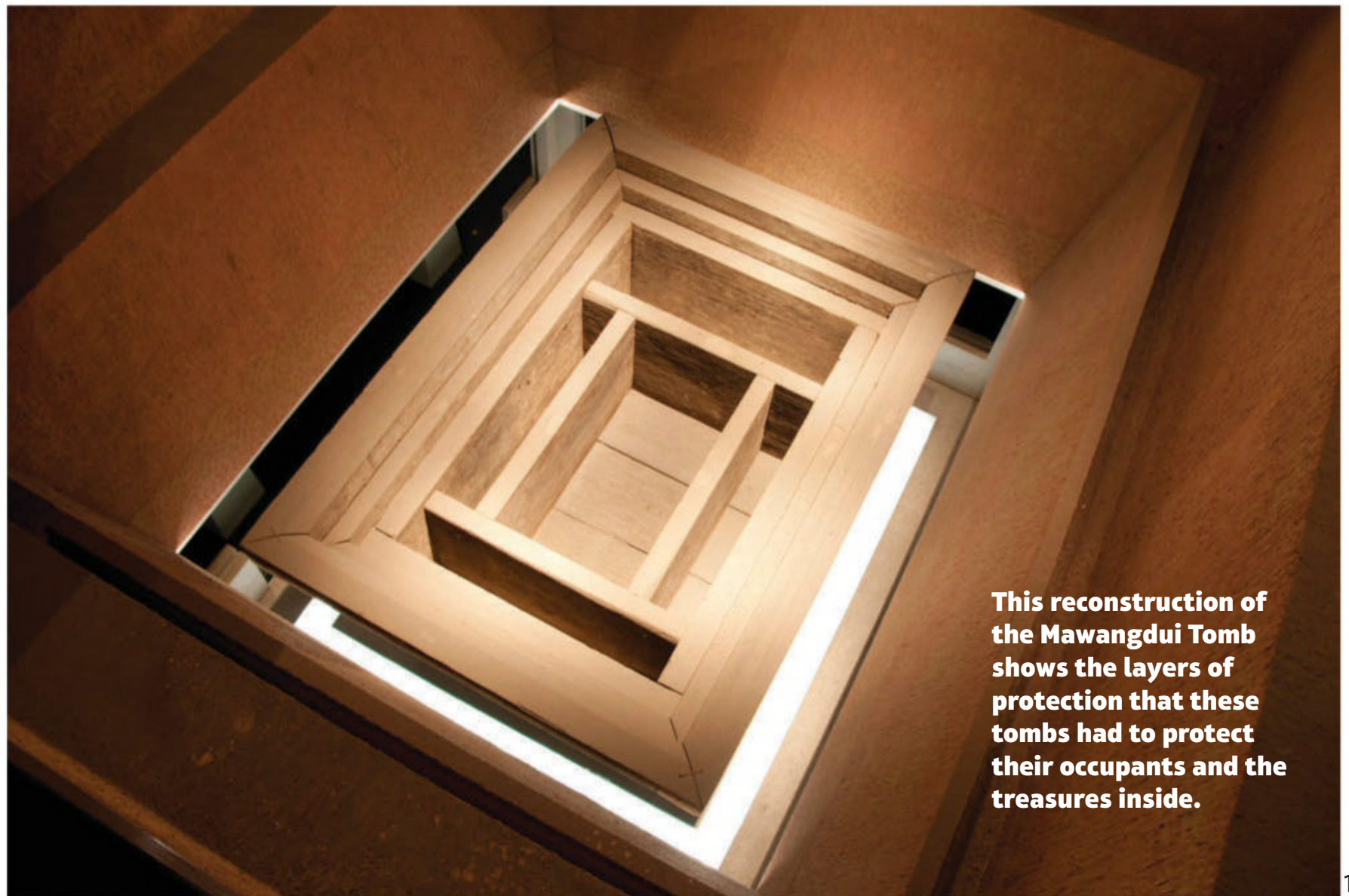
In China, there are maps that are more than 2,000 years old. They were painted on silk and buried in tombs that were only recently excavated.

But why would the ancient Chinese store maps in tombs? The reason is simple. People in ancient China believed that a tomb was a new home for the person who died. They envisioned it as a mirror-image of the aboveground home, so it needed to be equipped with many of the objects the person buried in it had had when alive. These included not only items needed for daily life, such as cooking utensils, but also other objects the deceased had liked or worked with when alive: musical instruments, books, and maps. These objects could be actual objects, models made from ceramic or even paintings on the tomb walls.

LET'S HAVE A LOOK NOW AT SOME OF THE MOST SPECTACULAR FINDS IN CHINESE TOMBS

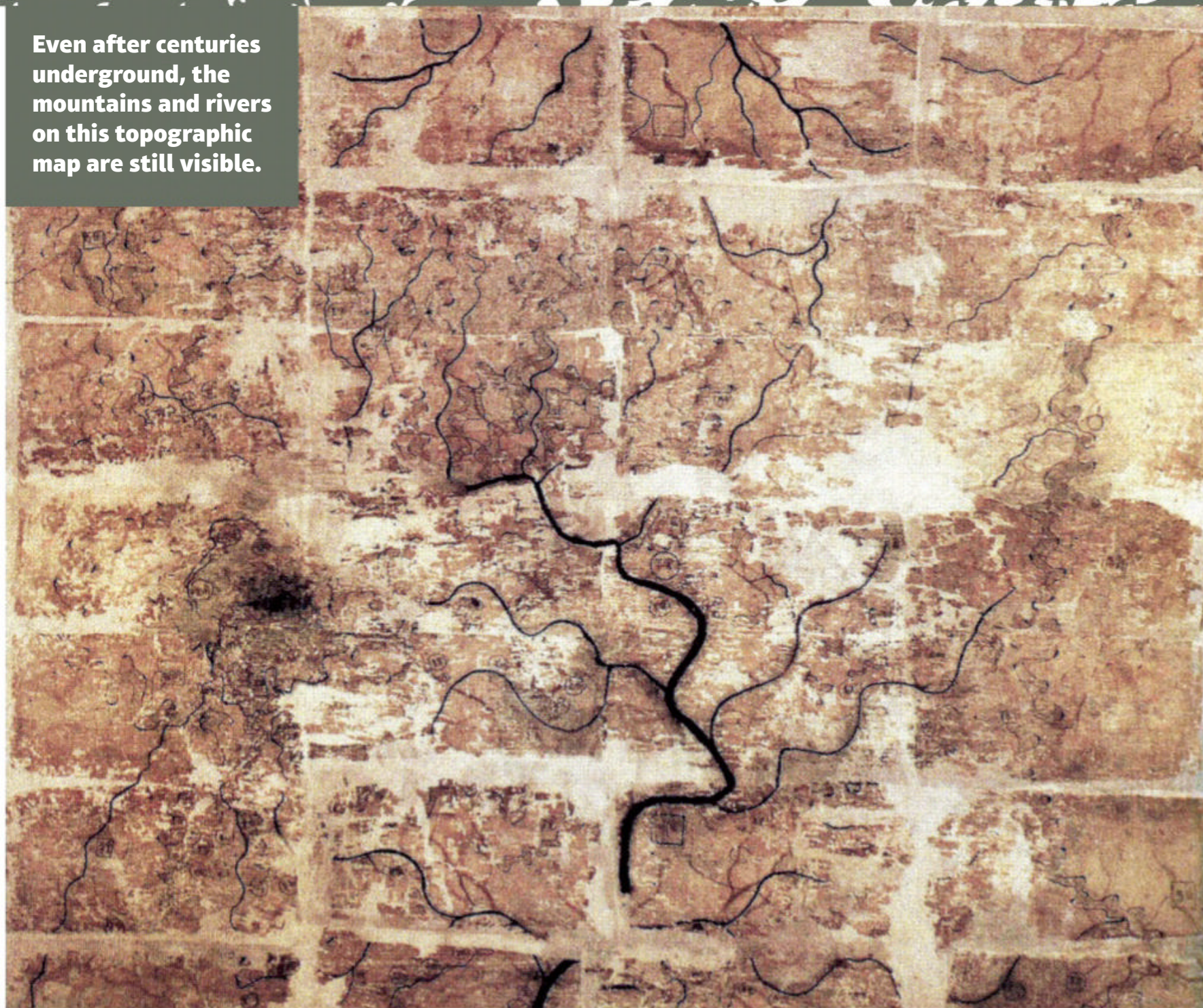
In Changsha, in southern China, three tombs dating to the Western Han dynasty were excavated in recent years. The burial chambers were more than 65 feet deep, its shafts filled with sticky clay that protected the chambers from humidity and tomb robbers. The depth and clay also meant that organic items such as food, textiles, and books written on bamboo were preserved in very good condition. Tomb Number 3 dates to 168 B.C.E. There, archaeologists uncovered three geographical maps, each drawn on silk. The archaeologists reckon that the person buried in the tomb was an official of the state, perhaps in charge of military affairs, and that he took part of his working materials into his tomb.

The maps are amazingly accurate — but only after modern scholars figured out how to read them! The ancient Chinese always placed



This reconstruction of the Mawangdui Tomb shows the layers of protection that these tombs had to protect their occupants and the treasures inside.

Even after centuries underground, the mountains and rivers on this topographic map are still visible.



south at the top of the map (in contrast to today's maps that have north always at the top). When the scholars turned the maps upside down, it became evident that one was a topographic map that depicted a region in Southern China — the present-day provinces of Hunan, Guangdong, and Guangxi. Painted on it are mountains, waterways, and county seats inscribed with the name of each.

The second map is believed to be a military map since it shows a detail of the first map that is of a much-contested region in the southernmost part of the country. What is more important is that features such as military headquarters are depicted. The color red was used for these sites, as well as for roads and settlements. Rivers were painted in blue-green, and other features and letterings in black. The scale of 1:80,000 to 1:100,000 is believed to almost 100 percent

accurate. The third map was in poor condition. Still, it was clear that it had been drawn on an even smaller scale since the inner and outer wall of a city can still be recognized on its lower edge.

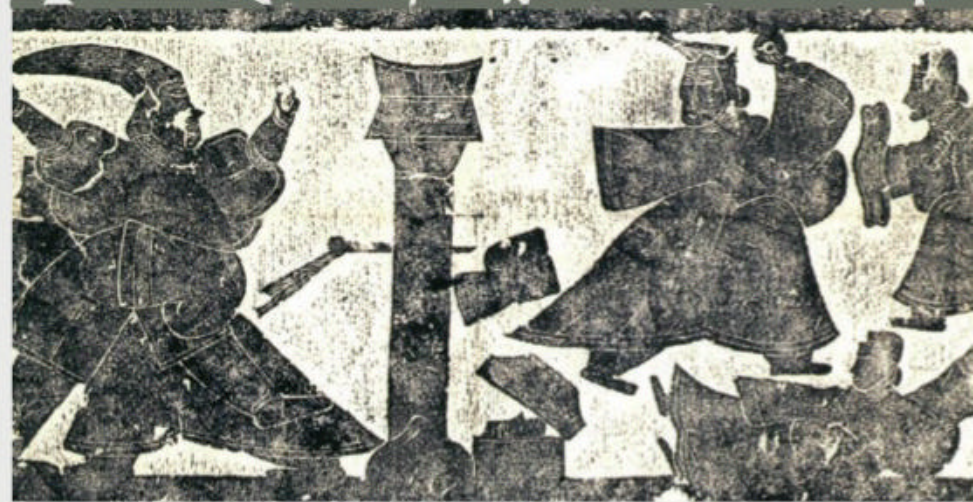
City maps have been found painted on tomb walls as well. In the northernmost section of China, in the city of Helinge'er in Inner Mongolia, the walls of a brick-built tomb dating to the second century C.E. are covered with scenes that tell the story of the tomb owner's life. While some are of more personal character — kitchen scenes and the tomb-owner inspecting livestock on his farm, for example — others illustrate details of his official career. Altogether, there are six maps, with the locations of cities and military stations marked. As they have inscriptions, we can determine exactly in which cities he was in office.

Several painters worked in the tomb, and analysis shows that they did not completely agree on how the maps were to be drawn. The scenes are actually quite extraordinary, because they offer a glimpse into city life 2,000 years ago. Each map offers a bird's-eye view, with a front view or just the roof of each house depicted. Cities have double walls for added protection. Streets and official and private buildings are shown, as well as markets and department stores. Interestingly enough, these maps are full of people. We see the tomb owner overseeing markets or receiving foreign guests while musicians are playing and food is being prepared in the adjoining kitchen.

A large area in ancient Chinese tombs was traditionally devoted to celestial paintings. These show stars, constellations, and other heavenly bodies. As a tomb was thought of as a microcosm of the living world, many of the tombs that date to the Western Han dynasty include this feature.

While some of the constellations shown are comparable to those found in our Western Hemisphere, most involve a different combination of stars and celestial bodies. Yet, as in the West, many are associated with ancient myths. In some cases, tiny figures of the deceased can be found among the constellations. These are accompanied by mythical figures. They, too, offer positive proof of how maps were to be used, viewed, and understood in Chinese tombs. The maps of cities that are on the walls detail scenes in the life of the deceased. The star maps that adorn the ceilings were meant to be signposts, helping the deceased navigate the path to the afterlife.

Annette Kieser is teaching Chinese art and archaeology at the University of Munster in Germany.



The story of Jing Ke has inspired many works of art, like this stone carving from the third century C.E.

A Map with a Dagger

What was the best way to gain access to the most powerful man in ancient China? Present him a map!

In 227 B.C.E., the heir-apparent, Prince Dan of Yan, dispatched his trusted retainer Jing Ke to assassinate King Zheng of Qin. He did so in order to prevent the annihilation of his lands. The plan failed, and Zheng of Qin became the First Emperor of China. Yet Jing Ke is still today a famed tragic hero.

Jing Ke knew he had to somehow get close to the king, and he knew just the way to do so. He would hand over the severed head of the former Qin general Fan Wuji, who had turned against Qin and committed suicide to support his failed attempt. Another "gift" would be a map of the most fertile area of the state of Yan. Such a map would also be highly valued. It could be seen as a token of submission and would certainly provide important strategical information.

King Zheng could not resist such a temptation and agreed to allow Jing Ke to present the gifts personally. Jing Ke prepared for his visit. It was forbidden to approach the king carrying any weapons, but he had hidden a dagger in the rolled-up map. Jing Ke planned to approach the king, take the dagger from the map, and stab him. But the king spotted the dagger before Jing Ke could strike. Since even the king's courtiers were not allowed to carry weapons, the king knew he had to act quickly. He managed to move far enough away to be able to draw his own long sword. He lunged at Jing Ke and wounded him. In desperation, Jing Ke threw the dagger but it found its mark only in a pillar. Jing Ke was killed, and Yan was then annihilated by Qin.

— **Monique Nagel-Angermann**

teaches Chinese history at the University of Muenster, Germany.



The Wooden Atlas

by Patrick Wertmann, illustrated by Jesse Tise

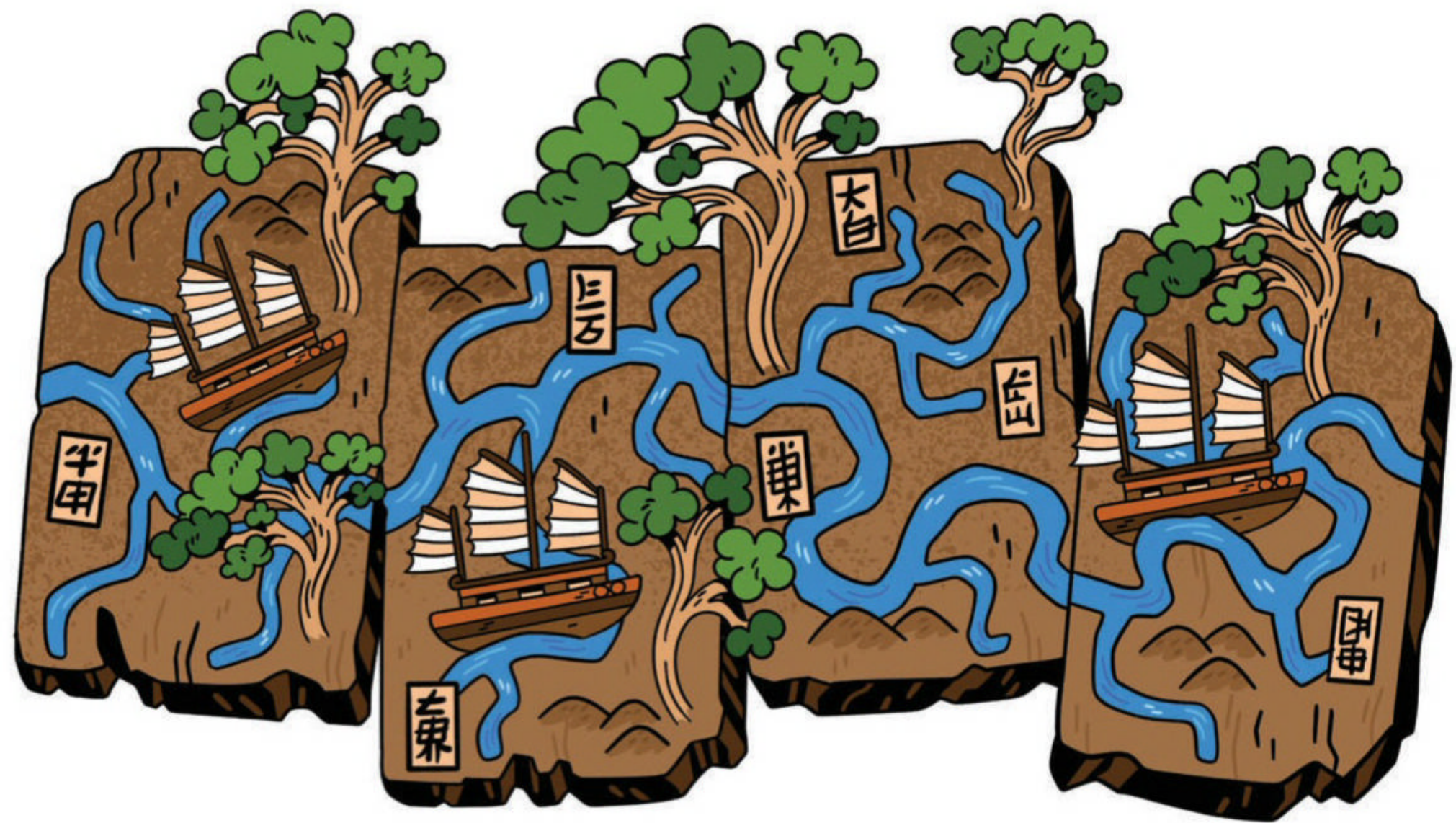
In 1986, thirteen tombs were found in Fangmatan, an area that lies close to the city of Tianshui in China's northwestern Gansu Province. Most were built during the Warring States Period (475–221 B.C.E.), a time when China was ruled by seven competing warlords. The tombs were located in Gui County, which lay within the realm of the state of Qin, the state whose ruler would later conquer all his rivals and unify the country.

What the archaeologists found in one of the tombs was quite a sensation — seven maps that, through a fortunate coincidence, had survived for

more than 2,200 years. In fact, based on contemporary historical accounts and artifacts unearthed from tombs of the same period, archaeologists were able to date the maps to exactly 239 B.C.E. This early date makes them the oldest known surviving maps from China.

HOW THEY WERE MADE

After two years of meticulous, difficult work, specialists managed to restore the maps and bring all their details back to light. The seven maps were drawn with black ink on four rectangular slabs of pine wood. The pieces all measured almost the



same size. Each is about 10.5 inches long, 7.13 inches wide, and 0.43 inches thick. Because the maps partially overlap with one another, they can be pieced together to form one map that represents a total area of more than 2,700 square miles.

WHAT THEY CONTAIN

These maps offer positive proof of how advanced the art and science of mapping was in China at the time. They include information about both the administration and the geography of Gui County. They also include the longitude and latitude of the area, as well as the most characteristic elements that are marked on today's maps.

In total, there are the names of 82 settlements on the maps. The more important ones — county seats, for example — are each enclosed within lines that form a square. Less important areas are simply named and have no lines drawn around them. Also labeled on these maps are roads, mountains, and rivers. In the case of the rivers, the name of each is typically written in the direction of the flow of the water.

THE FIRST ECONOMIC MAP IN THE WORLD

When you take a closer look, you will note another fascinating feature. The forests in Gui County are also defined. Interestingly, we can even recognize markings that describe the types and sizes of the timber to be found in the respective areas. This information offers valuable insights into what the local flora looked like during that time.

But that is not all. In some cases, even the distances from the forests to the settlements are marked. Can you guess why? Well, timber was an important commodity, and it had to be transported. For practical reasons, riverways were often used as the means of transportation. The Fangmatan maps include everything that was necessary for the organization of such journeys and transactions. Taking all this into consideration, they clearly served as economic maps for traders.

The King & the Cartographer

by Sylvia Whitman

A world map is a bold statement: it is an attempt to document every place on earth. King Roger II of Sicily knew that very well. It was the 12th century, and Roger's fellow Christians were producing maps with inaccurate, religious geography. What Roger wanted was a picture of the world that showed the lands as they were. So, he made a bold move. He invited the well-known Muslim-Arab geographer Ash-Sharif al-Idrisi to sign on as project manager for a large map. The king promised al-Idrisi a princely salary in return.

Most likely born in Morocco, al-Idrisi belonged to a family that claimed descent from the prophet Muhammad, the founder of Islam. Al-Idrisi had studied in Cordoba, one of the great centers of learning in Muslim Spain. Accounts survive that describe his first meeting with Roger in the palace at Palermo in Sicily. The year was 1138 C.E., and al-Idrisi rode in on a mule. Roger was there to greet him.

Al-Idrisi praised his patron's political and scientific abilities, saying that Roger was "responsible for singular innovations and for marvelous inventions, such as no prince has ever before realized." Tall, dark, and overweight, Roger was known for his energy and his intelligence.

Al-Idrisi knew that the king had been tutored by Greek and Arab scholars as a boy and that he surrounded himself with educated men, from philosophers to poets, mathematicians to mapmakers from many different cultures. Sicily had been under Muslim control for about 200 years until Roger's father, a Christian, took control of the island. While Sicilian Muslims and Jews were not granted the same rights as Christians, followers of all three religions lived and learned from each other with a tolerance known in nearby Muslim Spain as *convivencia*.



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Al-Idrisi created wonderful maps for Roger II (pictured at left), including a famous planisphere map. Although the map was destroyed, it may have looked very similar to this map, which opened al-Idrisi's atlas.



Roger's court included Christians, Jews, and Muslims from all around the Mediterranean, like these Muslim Arab musicians in the king's retinue.

For 15 years, al-Idrisi's multilingual team sifted through existing accounts of the world. At the time, Christian maps relied on Bible stories and tales more than on actual observations. For example, the charts included the **Garden of Eden**, as well as lands inhabited by monster men with dog heads. Islamic cartographers preferred to analyze translations of ancient Latin and Greek works (including *Ptolemy's Geography*); travel narratives of Muslim pilgrims, merchants, and scholars; and Islamic scholarship in astronomy and other sciences. Roger checked the map's

The **Garden of Eden, according to the Bible, is the beautiful garden that God made for the first man and woman, Adam and Eve.**



progress almost every day. At his direction researchers accepted only information that was the same in a variety of sources. They then posted it on a drawing board. To fill gaps in these documents, they interviewed seamen, traders, and travelers who passed through Sicily's ports. Roger even sent expeditions to gather data.

And so, the mapmaking began. Al-Idrisi decided that it should be a **planisphere**. The form was not a new one. Even the ancient Greeks had understood that the earth is a sphere, "stable in space like the yolk in an egg," as al-Idrisi put it.

A **planisphere is a map on a circular, flat surface that represents a three-dimensional sphere.**



Al-Idrisi's maps—like this large map of Asia Minor—used dozens of sources to accurately show precise details of coastlines and islands.

Religion and politics did creep into this scientific document, however. For example, Sicily appeared larger than its true size, and south was located at the top of the map. Why this position for south? Muslims face the city of Mecca in Saudi Arabia when they pray. When early Muslims carried Islam into newly conquered territories, they usually had to face south to line up with Mecca, so south became a sacred direction.

Although *The Book of Roger* contained some fanciful tales and distorted geography, it was far more accurate than other works of the time. Even today, readers can recognize the shapes of Europe, North Africa, and the Middle East. Al-Idrisi also labeled many port cities, including those in England and France. In addition, he noted the sources of the Nile River.

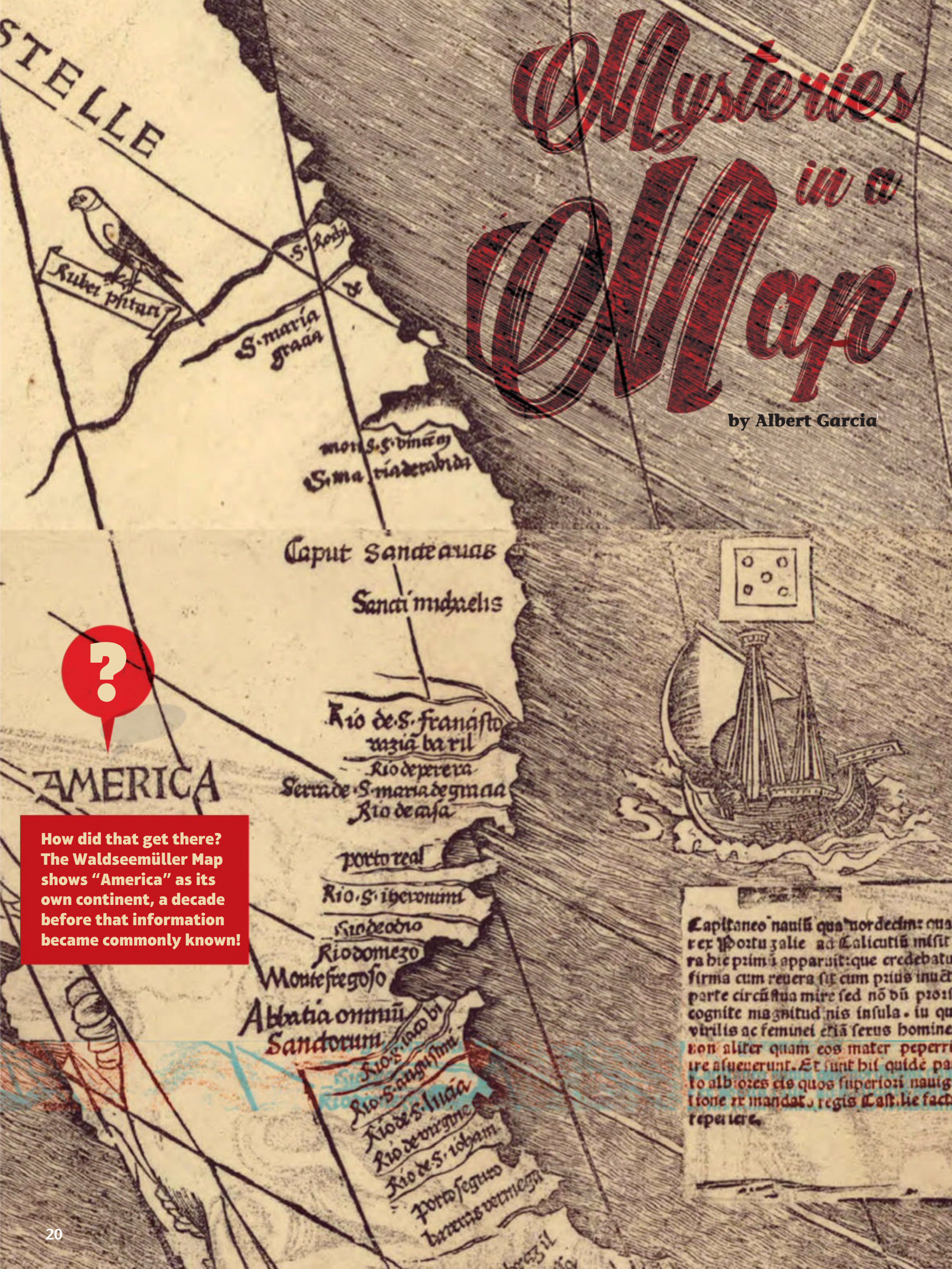
Al-Idrisi finished *The Book of Roger* shortly before the king died in 1154. He continued working for Roger's son and heir, William I. But in 1160, rebels stormed the palace and burned books and records, including a Latin edition of *The Book of Roger* that al-Idrisi had just given King William. In the chaos, the planisphere disappeared, probably melted down for its silver.

Al-Idrisi did not stay in Sicily. Religious conflict was erupting across Europe, ending *convivencia*. He returned to North Africa, where he died six years later. Fortunately, he brought with him *The Book of Roger* in its original Arabic. The work circulated in the Muslim world, influencing many geographers and historians. A Latin edition was not published again until the 17th century — too late to help Columbus or other pioneers of the European Age of Discovery.

So, on a 300-pound silver disk, engravers carved a world map with seven climate zones, “their lands and regions, their shorelines and hinterlands, gulfs and seas, watercourses and places of rivers, their habited and uninhabited parts.” Included as well were distances between various locations.

Eager for more, Roger then commissioned a manuscript: *Entertainment for He Who Longs to Travel the World*, or simply *The Book of Roger*. In it, al-Idrisi presented 71 maps — a round-the-world map and 10 regional maps (one for each of the seven climates). Drawing on years of research, al-Idrisi wrote about “all the wonderful things” of each country and “a description of the peoples and their customs, habits, appearance, clothes, and language.”

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Sylvia Whitman (www.sylviawhitmanbooks.com) often writes about MENA (Middle East and North Africa) history and culture and teaches writing at Ringling College of Art and Design in Sarasota, Florida.



Mysteries in a Map

by Albert Garcia



How did that get there?
The Waldseemüller Map
shows "America" as its
own continent, a decade
before that information
became commonly known!

Capitaneos nautici qua nord declina qua
rex Portugalie ad Calicutu misit
ra hic prima apparuit: que credebatur
firma cum reuera sit cum prius inuict
parte circū sua mire sed nō dū proxi
cognite magnitudinis insula. in qu
virilis ac feminei etiā serus homine
non aliter quam eos mater peperit
ire asuenerunt. Et sunt hic quidē pa
lo albi oves eis quos superiori nauig
lione re mandato regis Castilie fact
reperiere.

In July 1901, Father Joseph Fischer, an Austrian geography professor, solved a centuries-old mystery — accidentally. Fischer had gone to Wolfegg Castle in southern Germany to look for old Viking maps. On his third day there, he was carefully unfastening the brass clasps of a **folio** and saw that it was dated 1515. Looking through its pages, he saw that each page was a piece of a large map. The importance of his discovery was soon apparent when he saw the name “America” printed along the landmass that is present-day Brazil. Fischer had found what is known today as the Waldseemüller map.

America’s Birth Certificate

The Waldseemüller Map was printed in 1507 and is the first to include the name “America.” It is also the first to depict the Americas as distinct continents between two oceans. As a result, it is often referred to as “America’s birth certificate.”

The map is huge! When its 12 pages are assembled, it measures 4.5 by 8 feet. While reports note that 1,000 copies were printed, no originals had been seen for more than 300 years.

Finding the map, however, did not answer a nagging question. How did the map’s cartographers know the Americas were a separate continent? It was not until 1513 that Vasco Nunez de Balboa became the first European to see the Pacific Ocean from what is present-day Panama. It was another seven years before Magellan sailed across and named the wide expanse of water.

The Map Makers

The map was published in a book titled (in part) *Introduction to Cosmography with Certain Principles of Geometry and Astronomy Necessary for This Matter*. Compiled in 1507 by cartographers

Martin Waldseemüller of Germany and Matthias Ringmann of France, it was an ambitious update of the influential eight-volume book *Geography*. This book, dating to about 150 C.E., was written by the Greco-Roman astronomer and geographer Claudius Ptolemy. *Geography* features maps of the ancient world and also details the difficulties of projecting the earth onto a flat surface (see also pages 22–24).

Introduction to Cosmography included Ptolemy’s ancient maps along with charts and maps from the latest explorations of European explorers such as Christopher Columbus and Marco Polo. It also featured letters written by Amerigo Vespucci, a Florentine merchant who crossed the Atlantic at least twice between 1499 and 1502. Vespucci’s description of a large landmass extending south of the equator beyond the regions explored by Columbus greatly influenced cartographers at the time and in the decades that followed. He wrote, “I do not see why anyone should rightly prevent this [new part] from being called Amerigen — the land of Amerigo, as it were — or America, after its discoverer, Americus, a man of perceptive character.”

And so the name “America” was born.

New Home in the New World

When it was 500 years old, the Waldseemüller Map made its own voyage to America. Since then, it has been on display at the Library of Congress in Washington, D.C. There, it is the centerpiece of an exhibit named “Exploring the Early Americas.” Both the exhibit and the nation that owe their names to the acclaimed, yet mysterious, map.

Albert Garcia is an anthropologist and freelance writer living in southern California.

A **folio** is a book made with paper of a large size, used especially in the early centuries of European printing.

How to



Peel a PL

For centuries, cartographers have had to deal with the same dilemma: how do you make a flat picture of a round planet? Imagine taking an orange peel and trying to squash it flat. As you pull it this way and that, the peel tears or splits apart and loses its original shape.

Now, imagine attempting to do the same with the surface of the Earth. This is the greatest challenge of mapmaking: the presentation of all or part of a three-dimensional sphere as a two-dimensional flat plane.

Planetary Distortion

Unless you are looking at a globe, a map will always have some degree of distortion. It could



be its representation of distance, shape, angle, area, or direction. But while globes may be more accurate, maps are much more convenient and can focus on specific regions at any desired scale.

Maps are not simply drawings of earth's land and seas. They must be designed according to certain measurements that help counter the

distortion that occurs when the globe is squashed flat, like that orange peel. This distortion is not very noticeable on maps that focus on places too small to be affected by the curvature of the Earth, like cities or parks. But when larger regions are involved, especially continents or the Earth itself, the imagery can become severely skewed. The result is a map with unreliable and misleading geography.

Flattening the Peel

As awareness of distant lands and seas made its way across the ancient world, the difficulties of “flattening the peel” became evident. Cartographers developed mathematical formulas known as map projections. They used these to convert the coordinates of the earth's surface into points that could be mapped on a flat plane. Map projections are key to generating maps that have minimal distortion and greater accuracy.

Projection Pioneer

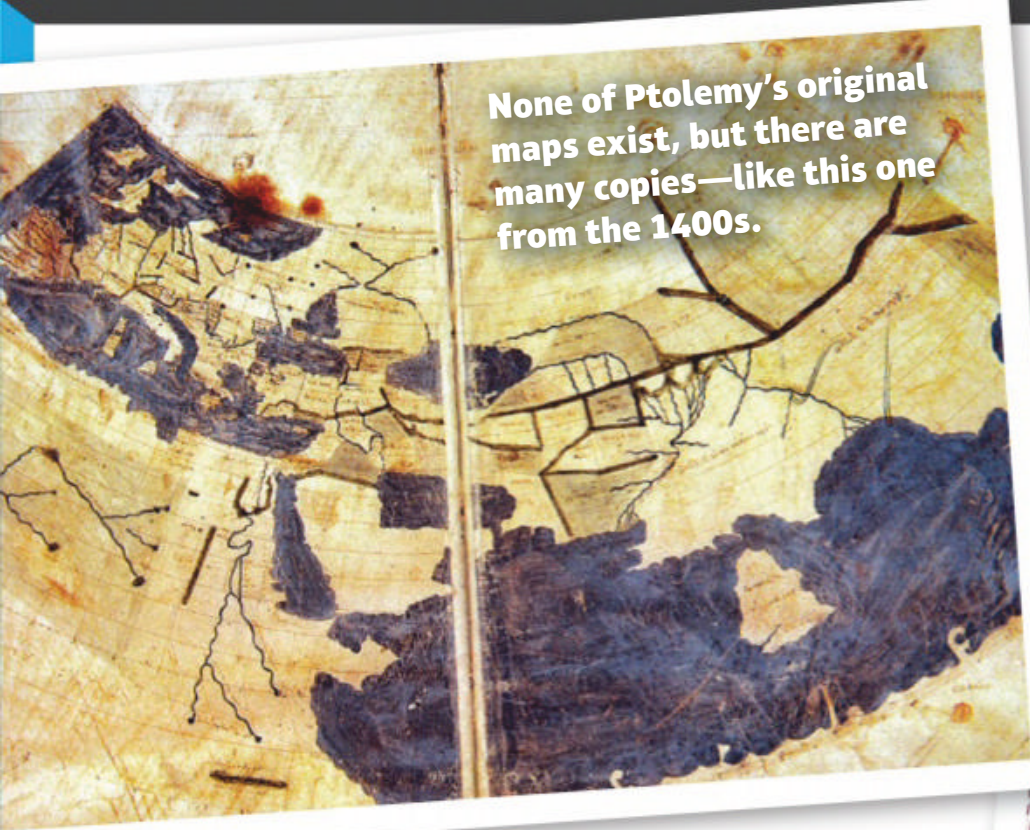
One of the first to implement map projections was Claudius Ptolemy, a geographer, mathematician, and astronomer who lived in Egypt in the second century C.E. Ptolemy introduced the concept of longitude and latitude reference lines to his maps. He also established some basic projection methods that are still in use today.

Ptolemy's maps were limited to the geographical information that was available

to him — basically the land and sea areas of the Mediterranean region and



This painting of Ptolemy from 1476 shows him wearing a crown. Ptolemy was not a king, but he was so famous that artists gave him the royal treatment.



the Roman Empire. They were far from precise. Still, the theoretical and mathematical procedures he devised were instrumental to the development of cartography.

The Mercator Projection

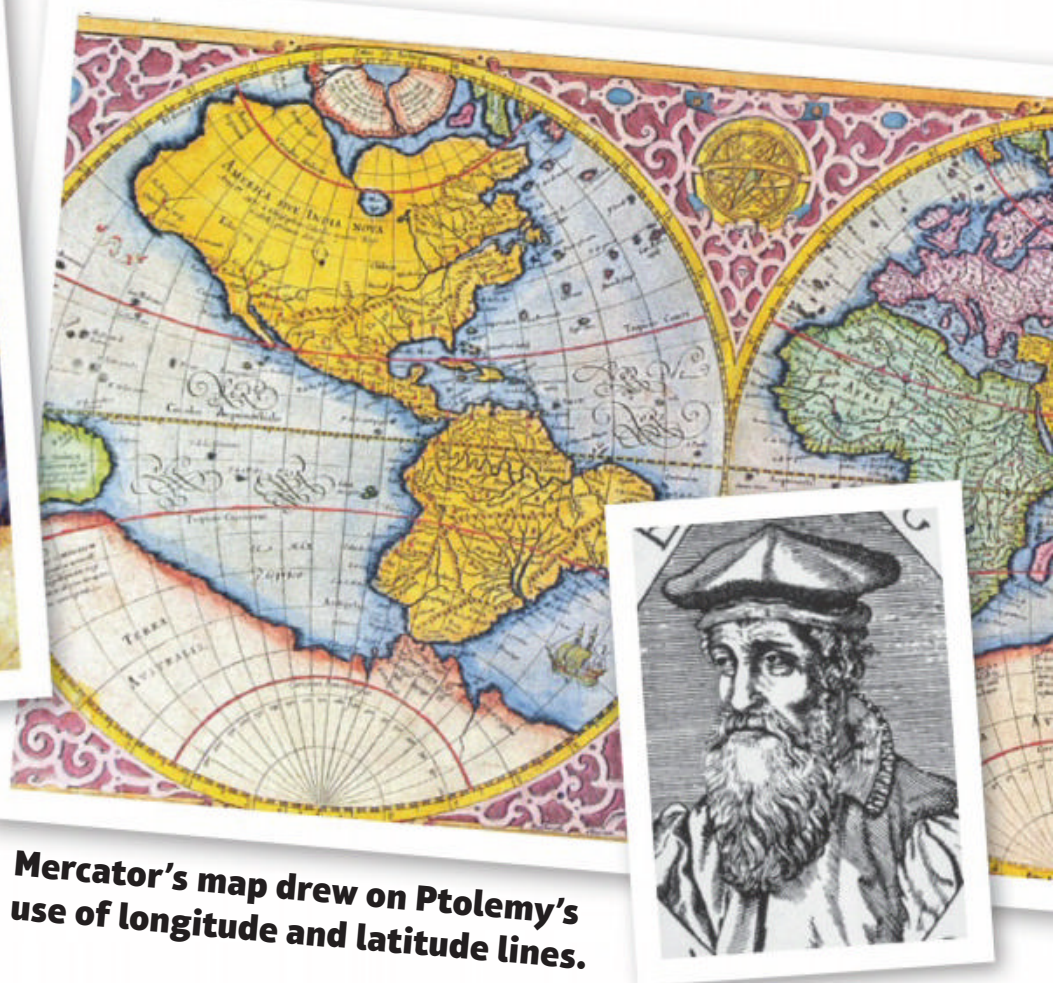
During the global expansion of exploration, trade, and colonization in the 16th century, European merchants and mariners returned home with new nautical charts and a growing need for up-to-date and accurate maps. They knew that an inaccurate map could doom any seafaring expedition.

The 16th-century German-Flemish geographer, cartographer, and globe maker Gerardus Mercator collected this new information and added it to his existing maps. In 1569, he printed a world map that revolutionized oceanic navigation. In fact, it is still used today!

Mercator's map envisioned the earth as a cylinder and "unrolled" it. In doing so, it created a rectangular map with added parallel longitude and latitude lines that were similar to Ptolemy's. Sailors could successfully plot routes by setting a compass to the direction of a point on the map. There was little need for adjustment.

The Mercator projection continues to influence nautical charts today. However, it has problems of its own. Transforming the earth into a cylinder enlarges landmasses that lie further from the

Mercator's map drew on Ptolemy's use of longitude and latitude lines.



Gerardus Mercator

equator. South America, for example, appears to be roughly equal in size to Greenland even though it is actually eight times larger.

Into the Modern Age

There are now three main projection types. Each depends on the purpose of the map. One is cylindrical — the Mercator projection, for example. The second is conic, in which the earth is projected as a cone and laid flat. The third is azimuthal, a projection similar to viewing earth from space and drawing the landmasses as they appear. Each type has many variations, and new ones continue to be developed. There are even cartography programs to help you create your own map.

Next time you are looking at a map, take a moment and find the scale and the type of projection. Then decide what the cartographer chose to display most accurately and where you see distortion.

Maps are designed for many different reasons, and projections offer a great variety of different ways to design them. There is more than one way to flatten a peel.

Archeology 101

Archaeologists are always using new technology to improve the way they map important sites.

IN THE 1900s AND EARLY 20TH CENTURY, MAPPING WAS DONE USING MEASURING TOOLS SUCH AS CHAINS, LONG PIECES OF ROPE, AND BRIGHTLY COLORED STAFFS AND FLAGS TO MARK FEATURES. THE MAPS WERE DRAWN BY HAND. THEY WERE VERY ACCURATE, BUT TOOK A LONG TIME TO MAKE.

IN THE 1980s AND 1990s, SURVEYORS STARTED USING ELECTRONIC DISTANCE MEASURERS AND TOTAL STATIONS (WHICH USED LASERS TO MEASURE DISTANCE AND DIRECTION) AND FED INFORMATION TO COMPUTERS. THIS MADE MAPPING MUCH FASTER.

TODAY, PORTABLE DIGITAL IMAGING SYSTEMS CAN BE USED TO CREATE HIGHLY ACCURATE 3D SCANS OF BUILDINGS AND LANDSCAPES, MEANING ARCHAEOLOGISTS CAN RECORD SITES QUICKLY AND ACCURATELY — IMPORTANT IF THE SITE IS UNDER THREAT OF DESTRUCTION.

illustrated by John Gordon-Swogger

The Road — to Edo —

by Gloria W. Lannom

Students in Japanese schools today learn to draw maps of their classrooms, school grounds, and neighborhoods. Bookstores in Tokyo and other cities around the country have shelves filled with maps and travel guides. Subway and train maps are free. Why? Because travel is very popular in Japan! But this wasn't always the case.

In centuries past, the Japanese had little use for maps. Most people spent their lives farming rice paddies and seldom left home. Only officials and members of the upper class could read and write. It wasn't until the relatively peaceful **Edo Period** that political, social, and economic changes occurred. During that time, *shogun* (Japanese for "great generals") from the Tokugawa clan ran

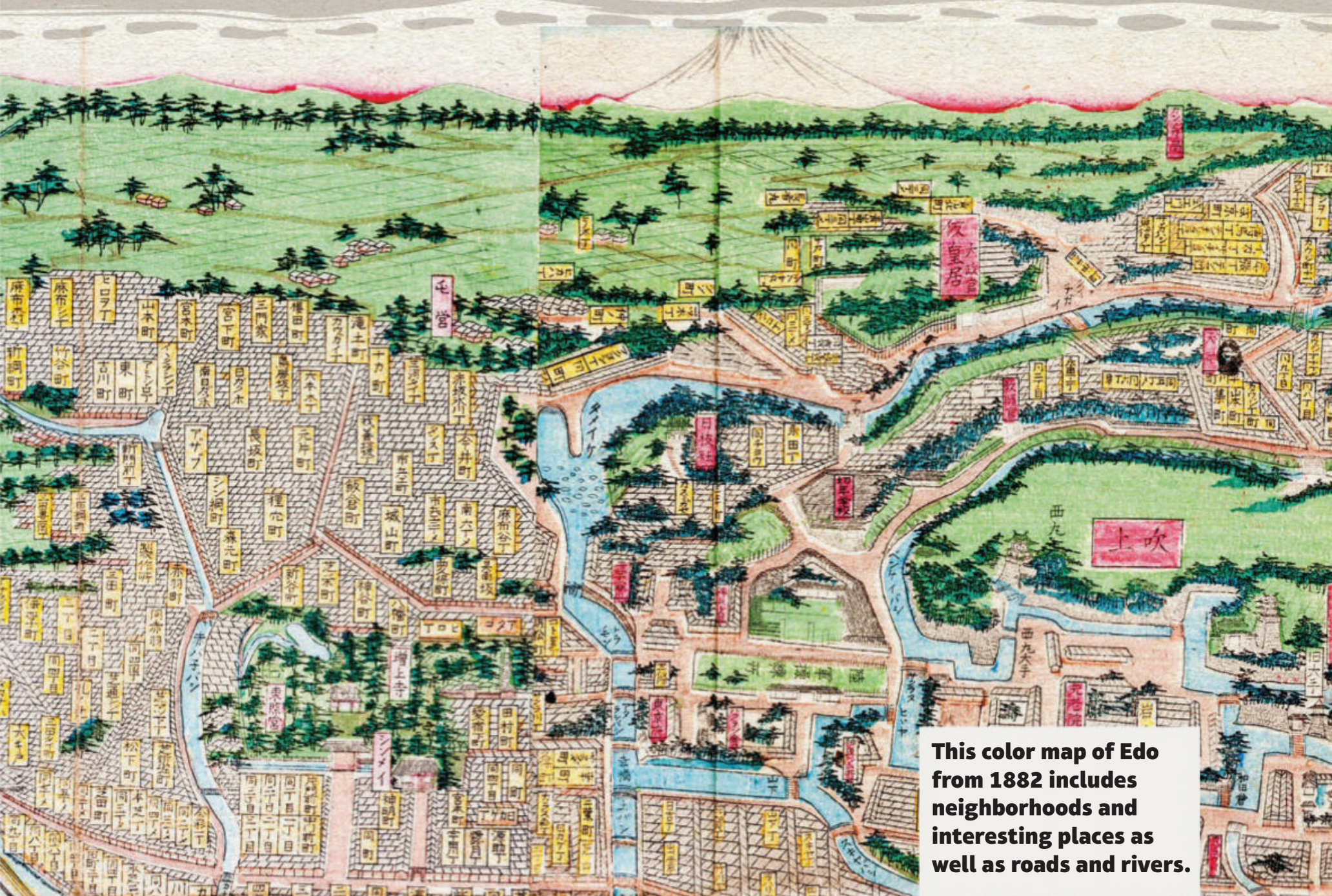
the country's government from Edo (present-day Tokyo). Travel for official business increased greatly, especially via the Tokaido Road, which stretched between the cities of Edo and Kyoto.

Shogun rulers feared uprisings by the *daimyo* ("lords") who owned estates around the country and maintained small "armies" of **samurai**. The shogun required each *daimyo* to travel to Edo every other year to swear his loyalty to him and to pay tribute with gifts, as a way to keep the daimyo from organizing against him. To further prevent unrest and to forestall invasion by Westerners, the Tokugawa rulers restricted foreign travel and in 1635 closed the country to almost all outsiders. But within the country, movement from town to town was only growing.

As the economy improved, travel for social and economic reasons increased significantly. Many people, especially merchants, now had money to spend on travel for pleasure. Access to different areas of Japan had become easier, and maps became better at meeting travelers' needs. Five major highways led to Edo. *Nihonbashi* ("Japan Bridge") at the city's center was the central point from which all parts of the entire country were measured.

Hiroshige Ando showcased beautiful landscapes in his art. In this print, some *daimyo* stop to rest and enjoy the scenery on their way to Edo.





This color map of Edo from 1882 includes neighborhoods and interesting places as well as roads and rivers.

Pilgrimage was important in Buddhism and Shinto, the two principal religions followed by the Japanese. For pilgrims visiting the country's many temples and shrines, communities near these places built inns and offered entertainment. The Eighty-Eight Temples of Shikoku Island was a favored destination. There, many pilgrims used special maps to guide them on the proper path from temple to temple. Also very popular as a travel destination was Mount Fuji, Japan's most sacred mountain. To attract religious pilgrims, Edo mapmakers added drawings of religious buildings, landscapes, and other major landmarks to their works. These maps were not always accurate, and some placed Japan and the Pacific Ocean in the center of the world. As the literacy level increased, so did readership of books and maps. As a result, Japan's printing industry flourished. Today,

researchers have digitized many of these historic maps to preserve them.

Travelers were the subject of many Edo Period artists' work. Among the most popular 19th-century block print artists was Hiroshige Ando, who won renown for his *The Fifty-three Stations of the Tokaido* and *One Hundred Famous Views of Edo*. Another well-known artist was Katsushika Hokusai — especially his work titled *Thirty-six Views of Mount Fuji*. Their colorful and entertaining travel series highlighted the adventures of porters and travelers along the highways and brought map place names to life. They also introduced viewers to the excitement of travel — an excitement that continues among the Japanese today.

While living in Tokyo, **Gloria W. Lannom** and her family visited many of Japan's islands by train, plane, car, bus, and ferry boat.

The Edo Period (1615–1868) is also called the Tokugawa Period, named for the Tokugawa shogun rulers whose reign lasted 250 years.

In past times, samurai were members of a powerful class of warriors in Japan.

Early American Maps

by A. Gwynn Henderson

Where is...? How do I get to...? How far...? These questions have been asked for as long as there have been people. And for as long as there have been people, they have tried to answer these questions with maps.

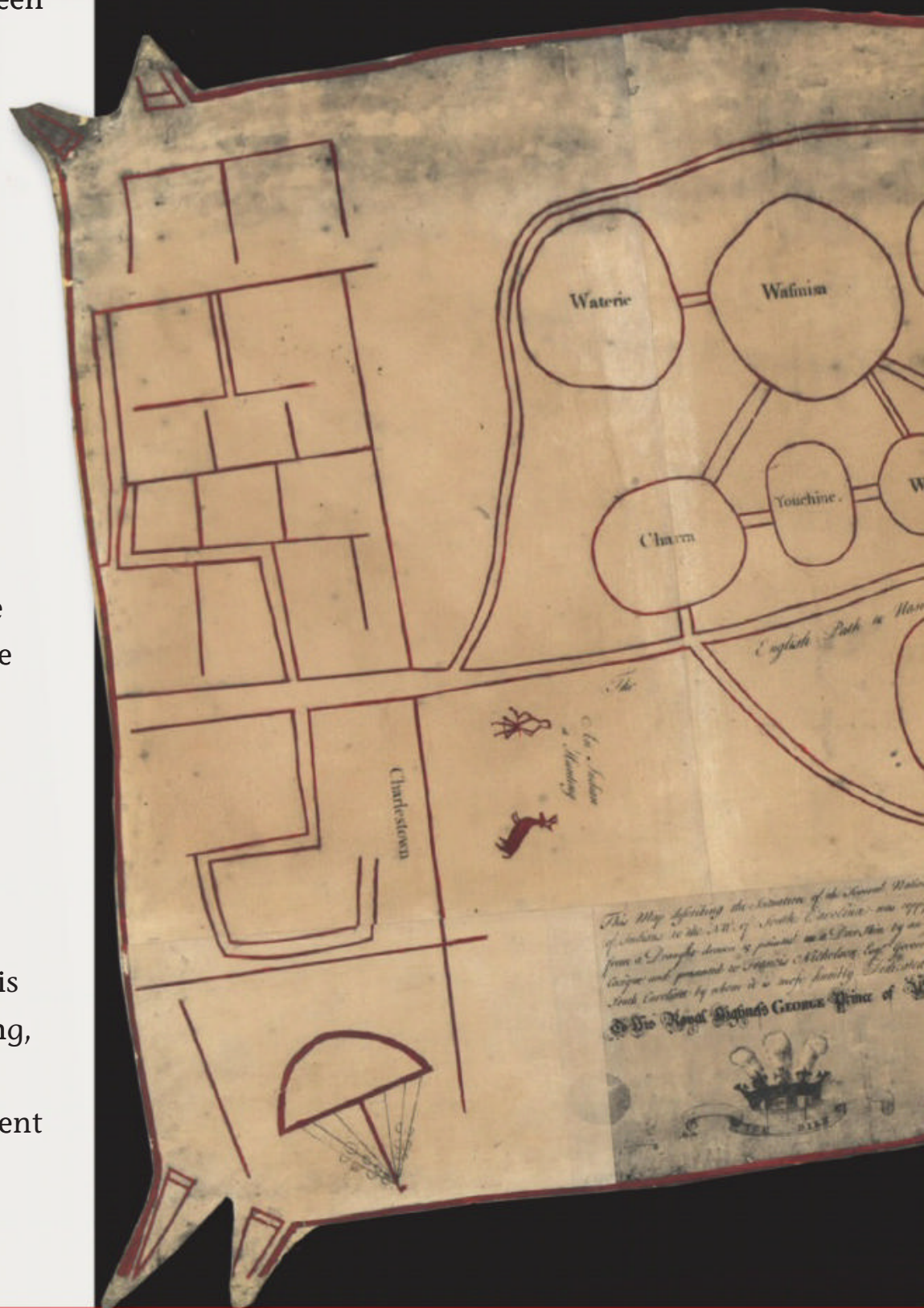
No Pen and Paper

But without a pen and paper, how do you make a map? Think about it. Maps do not have to be portable! You can use a pointed stick to draw in the dirt. As you draw, show the important landscape features. Mound up handfuls of dirt to form hills, ridges, and mountains. Arrange little sticks and larger branches to symbolize rivers and streams. Pile up pebbles to show town locations — the more pebbles, the more inhabitants!

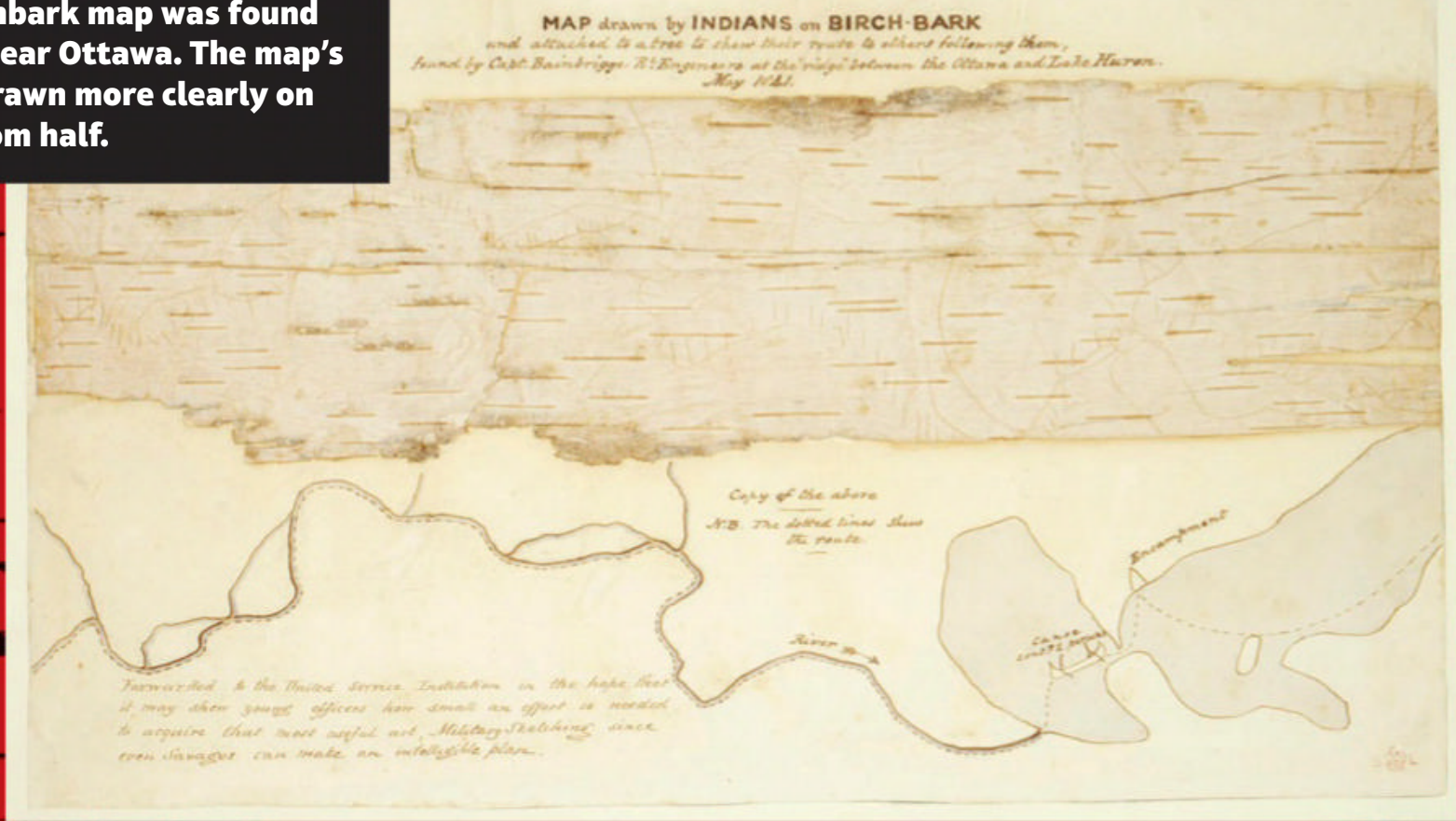
Native Map Materials and Inks

Journals and letters written by Europeans in colonial times describe the Native peoples of Eastern North America making these kinds of quick, in-the-moment, non-portable maps. It is very likely that they made maps like these long, long before Europeans arrived.

But Native people also made more permanent and portable maps at this time as well — for



This birchbark map was found in 1841 near Ottawa. The map's path is drawn more clearly on the bottom half.



A reconstruction of the deerskin map given to South Carolina Governor Francis Nicholson by the Chickasaw tracker Squirrel King in 1721.

themselves and for Europeans. In the Northeast, Native mapmakers preferred rectangular strips of bark cut from the paper birch. Large, irregularly shaped deerskins were more commonly used for maps in the warmer Southeast. Europeans often copied the information from animal skin maps onto paper. These paper copies, and not the maps themselves, are what have survived.

For ink, Native mapmakers mixed animal grease and natural pigments. They used crushed wood charcoal for black, and crushed hematite (the most important ore of iron) for red.

Permanent Birch Bark Maps

Native peoples thought of birch bark maps as relatively permanent and often carefully stored them away for future reference. For birch bark maps, Native mapmakers used the outer bark (phloem) and the thin intermediate layer (cambium). Spring was the best time to strip off the bark, as it was most flexible then and would lie flat in no time.

Bleached by the sun, the outer silvery-white bark had many closely spaced, short, linear scars left behind by small branches. Mapmakers tried not to catch these scars with their hardwood or bone stylus as they drew fine lines on this side. The inner bark, darker and softer, was better for mapmaking. The linear scars were only ripples, and the stylus left deeper, wider lines.

Birch Bark Message Maps

Native peoples also made small birch bark maps for travelers. These message maps showed nearby streams, footpaths, and sometimes the locations of Native camps and villages.

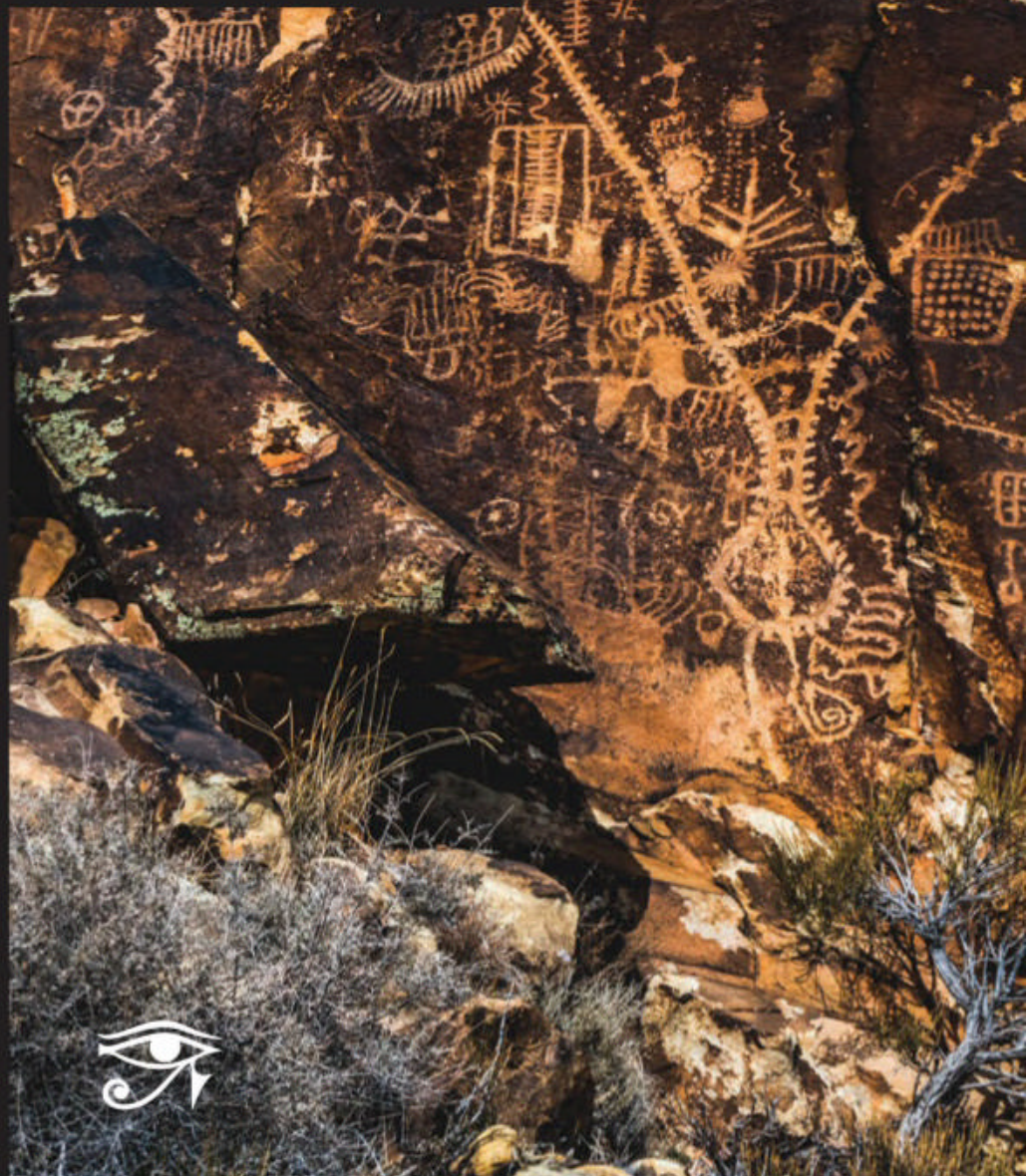
After drawing the map, the Native mapmaker marked a stick to attract a traveler's attention and pounded it into the ground near the trail edge. The mapmaker then folded the map up and slipped it into the split end of the stick. The stick was leaned in the direction of the travel noted or recommended on the message map. When travelers discovered the marked stick, they opened up the map and learned about the paths and landscape features that lay ahead of them.

Awesome Mapmakers

Native mapmaking skills impressed Europeans. In the late 1600s, the French Baron Lahontan described the maps made by Native Americans he had met in the St. Lawrence and upper Mississippi river valleys:

They draw the most exact Maps imaginable of the Countries they are acquainted with, for there's nothing wanting in them but the Longitude and Latitude of Places. They set down the True North according to the Pole Star; The Ports, Harbors, Rivers, Creeks, and Coasts, of the Lakes; the Roads, Mountains, Woods, Marshes, Meadows and etc., counting the distances by Journeys and Half-journeys...

In the Southwestern U.S., petroglyphs (markings on rock) from hundreds of years ago are another form of early American maps. Utah's Zipper Glyph (below) is a calendar and a map for finding the position of the sun.



Native Mapmaking Principles

Like Europeans, Native peoples used maps to share information about how features were arranged on the landscape. But the ways Native peoples thought about and measured space were different. As a result, it was difficult for Europeans to interpret the maps. Still, Europeans depended on information from Native peoples and from their maps to find their way in a foreign land.

Native mapmakers did not use the principles and techniques of geometry. Their maps were topologic maps. This meant that their simplified diagrams showed no unnecessary details, only information most important to Native people or the landscape features Native people used or



visited most often. This meant that Native maps often did not show the landscape features European explorers or travelers considered important. Native mapmakers might draw a small spring or a low sacred hill and not include a much larger lake or mountain.

Native maps also lacked consistent scale. They showed the relative locations of important landscape features, but not their exact locations. Native mapmakers used the cardinal directions—north, south, east, west—but distance was based on experiencing the journey. For example, they would say, “It usually takes three days to get to the river mouth from my village,” and not, “It is 10 miles to the river mouth.”

Making Sense of the World

All maps reflect information that the cultures and the peoples who make and use them think is important. In this way, they are windows into these peoples’ lives.

A. Gwynn Henderson, staff archaeologist and education coordinator at the Kentucky Archaeological Survey, has been interested in Native-made maps ever since she read Gregory A. Waselkov’s article about Southeastern U.S. Native maps.

To read more about Native map history, check out:

www.chickasaw.tv/events/chickasaw-world-view

www.chickasaw.tv/videos/chickasaw-maps-geography-relationships-and-power

ACTIVITY **Be A Mapmaker!**

by A. Gwynn Henderson

To experience how Native mapmakers in Eastern North America made maps in colonial times, try drawing a map that shows how to get from your house to your school, place of worship, or favorite place (park, movie theater, or library, for example).

Use a pencil or a crayon and one sheet of blank paper — that’s it. Rely only on your knowledge of the landscape and local landmarks. No erasing, either! Native mapmakers, once they drew on deerskin or birch bark, could not erase.

Check your map’s accuracy by consulting Google maps or an atlas of your community. Are your distances and directions right? Why did you put certain streets and landmarks on your map and leave others off? Show your map to someone else. Does it make sense to them?



THE CURIOUSLY CHANGING CONTINENT

by Albert Garcia

By the end of the 1500s, technological advances in shipbuilding and navigation guided explorers to more distant places — most notably the Americas. With their discoveries, cartographers had more information than ever to fill in the empty spaces on their maps of the world. The earliest of these maps were designed when knowledge of the Western Hemisphere was still in its early stages. And even though the size and shape of the Americas were both still a mystery, cartographers still did their best to illustrate the two continents.

The Race to Map!

During the **Age of Discovery**, nations and kingdoms were in fierce competition to colonize

new territories and locate natural resources to fund the expansion of their empires. Maps were prized and guarded for their strategic military and commercial value. Schools of mapmakers sorted through the oral and written information coming back from across the oceans. Their task was extremely difficult. They had to accurately depict a world that had yet to be completely explored. In addition, creating accurate maps required the use of projections (see pages 22–24), a science that was still being developed and used in different ways by different cartographers.

New World, New Maps

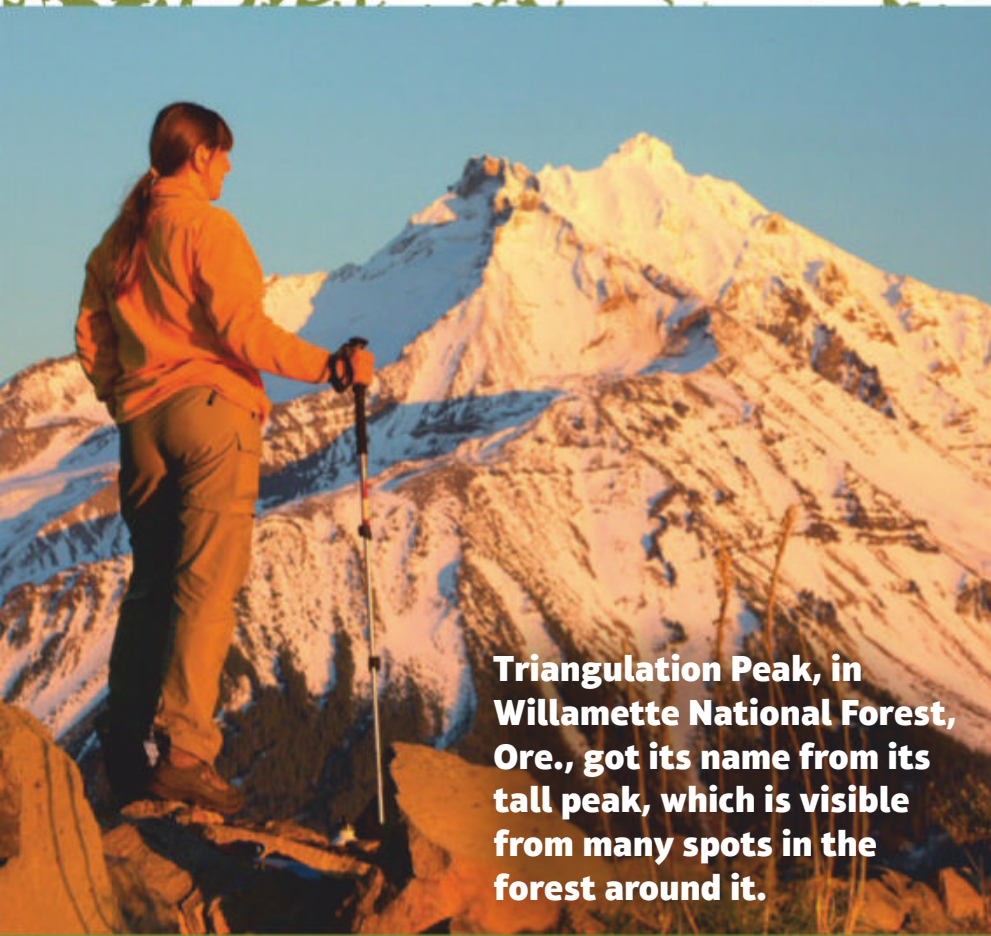
The first map to feature the continents of the New World was designed by one of the first Europeans to see it — Spanish cartographer Juan de la Cosa.

Age of Discovery is a period from 1400 to 1600 during which Europeans traveled the rest of the world in search of goods, raw materials, and trade partners.

Juan de la Cosa's *mappa mundi* is covered in fine decorations. It was probably commissioned by a rich noble of the Spanish court.



The Cantino Planisphere is full of details showing regions' buildings or animals, like the three parrots sitting on the coast of South America.



Triangulation Peak, in Willamette National Forest, Ore., got its name from its tall peak, which is visible from many spots in the forest around it.

What Is Triangulation?

Imagine you are hiking in the great outdoors. You have a compass and a map that offer clues to your surroundings. But, as you unfold the map, you ask yourself, “Where am I?”

It would be easy if your map had one of those “You are here” arrows! But, it does not know where you are and neither do you! With some orienteering skills, however, and a technique called triangulation, you could easily find yourself or other unmapped locations. As its root word suggests, triangulation is used to locate the points of an invisible triangle. Thanks to basic geometry, you need only the location of two points of a triangle on a map to find the missing one — in this case, you.

Triangulation is used mainly for unknown or shifting locations, such as forest fires, earthquake epicenters, distress signals, and even satellites hurtling through space. It requires two landmarks that are visible both around you and on your map — mountain peaks are ideal and easy to spot. You can point the map north with the compass and trace its edge to draw lines to the two visible features. These are two sides of the triangle, and where they intersect is your general location.

This same technique can be used to find any points of a great imaginary triangle. You might know where you and another feature are on a map but you want to travel somewhere else. As long as you have your compass, an accurate map, and two visible features, you can triangulate. It’s a “You are here” arrow you can make yourself!

—Albert Garcia

De la Cosa had sailed on Columbus’ three voyages between 1492 and 1498. He had also accompanied Amerigo Vespucci and Alonso de Ojeda on their 1499 expedition across the Atlantic.

In 1500, de la Cosa designed a *mappa mundi* (Latin for “world map”). It was a compilation of existing charts, observations from his own travels, and maps from the English-funded explorations of the 15th-century English explorer John Cabot. It was what is known as a portolan map, a style that was popular with sailors in the 13th and 14th centuries. This type of map focused on harbors, shorelines, ocean and wind currents, and other useful seafaring information.

De la Cosa’s map correctly presented a coastline stretching continuously from north to south along the eastern coast of the Americas. Until then, North America had been mapped as a series of islands due to the fact that by 1500, no Spanish ships had sailed to the mainland. The coastline of Central America, at the time still unexplored, is obscured with a drawing of Admiral Columbus.

Two years after de la Cosa’s *mappa mundi*, a map known as the *Cantino Planisphere* was the second map to display what was known of the Americas. It included a South America covered with colorful macaws and trees. Designed in Portugal in 1502, it was smuggled to Italy by Alberto Cantino.

Territorial Claims

The Age of Discovery became the Age of Conquest as more expeditions were sent by different kingdoms. Maps were designed to lay claim to new territories. Sometimes they also had an agenda, such as displaying landmasses full of resources to entice funding for future exploration. Economic interest and colonization defined whose maps were most accurate: Spanish maps described Central and South America and the western

On many European maps, California was drawn as an island for almost 200 years.



coasts with greater detail. Portuguese maps featured detailed coastlines of Brazil. English maps covered much of the eastern North American shoreline, bays, and riverways.

Charting the New World

Collecting all of this information from different (and often feuding) countries and projecting it onto one map was not an easy task. It would take centuries for the Americas to be displayed accurately. The Waldseemüller Map (see pages 20–21), printed in 1507, was the first to project the Americas as a landmass separate from Asia. For many people, this new way of viewing the world introduced the idea that there was not only an unexplored western coast of the Americas, but also an uncharted ocean on the other side.

With its landmass the closest to Europe and the earliest to be charted and colonized, the eastern seaboard was the first to come into sharper focus. A map printed in 1606 by Dutch cartographer

Jodocus Hondius displayed a fairly accurate continental shape. It showed the eastern coasts that had been explored by the Spanish in greater detail than ever, but it left the unexplored interior of North America blank. Captain John Smith, a founder of Jamestown, the first English settlement in the Americas, published the first map of the English colonies in 1612. It had incredible detail and was used for exploration, trade, and settlement for more than 70 years.

The Isle of California

There was one land feature of the New World that seemed to give cartographers a particularly difficult time. In the 1500s, Spanish maps had correctly displayed Baja California as a peninsula. Yet, British mathematician Henry Briggs published a map in 1622 that clearly showed a large island off the

southwestern coast of the present-day United States. Briggs's map influenced others for centuries to come. In fact, hundreds of maps were printed in the 17th and 18th centuries with this cartographic blunder. Finally, a decree by Spain's King Ferdinand VI in 1747 correctly returned California to the mainland. It would take still more time for maps to be drawn and published that did not include the error.

Continental Completion

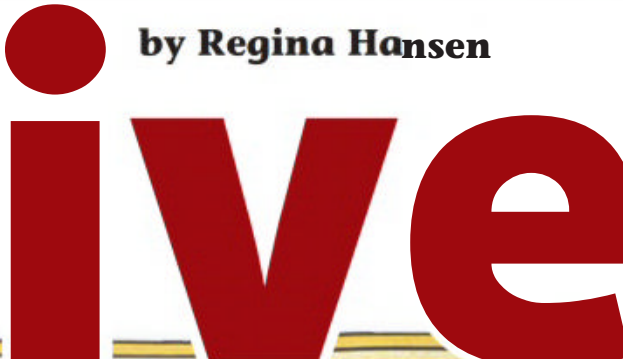
Since the 1700s, advances in technology and an increased scientific approach to mapping have helped to correctly illustrate the American continents. The United States Geological Survey and agencies in other nations today continue the work of those early cartographers. Now, satellites, speeding around the planet, are completing the nearly 500-year long project of mapping the Americas.

A Matter of **Perspective**





by Regina Hansen

[illegible]

In 2017, the city of Boston, Massachusetts, started to phase out the Mercator map in its public schools. Instead, they chose the Gall-Peters projection, which shows the countries at their correct size. Still, many people find the Gall-Peters map troublesome because it stretches out the countries, making them look longer and more distorted.

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The Winkle Tripel Projection, developed in 1921, has been used by the National Geographic Society since 1998. This type of map uses a combination of three different projections to create a less distorted image of the earth. In August 2018, the Equal Earth Projection was made available online for free. Its creators claim that it shows “countries and continents at their true sizes relative to each other.”

Many times, maps are chosen or created not for their relative accuracy, but for political reasons. Not all countries agree on the exact locations of their borders, and maps can reflect this conflict. For instance, in 2014 Russia annexed the Ukrainian state of Crimea. While Russian maps show Crimea to be within Russian borders, the United States government has refused to make the change on their official maps, because they do not recognize Russia’s claim to the area. Nor are borders the only part of the map that can be disputed. Names can be as well. What Iranians call the Persian Gulf is called the Arabian Gulf in Arab countries. In 2010, Iran chose to ban airlines that did not use the term Persian Gulf on their inflight monitor maps.

In choosing where to place a border or what to name a country, mapmakers have to make political choices. They also have to abide by the laws of various countries. This is true even when the map is electronic. The HERE Global Positioning

System (GPS) could not be included in cars sold to China unless its map showed the country of Taiwan to be part of the Republic of China, even though the rest of the world recognizes Taiwan as its own country. In 2014, China released a map that shows Taiwan and all of the South China Sea within Chinese borders, a claim that is very much disputed by many nations.

Many countries make maps specifically for propaganda — that is, to reinforce their own political messages. The Imperial Federation map, created in 1886, uses the Mercator projection. It also includes a border with pictures of the world’s people all looking toward the image of Britannia, the female representation of the British Empire. These images were meant to reinforce the idea that Britain was the center of the world. At the same time, the map’s designer, a British artist named Walter Crane, may have also tried to undermine that idea with his illustrations, since some of the people in the pictures are shown to be suffering. In 1956, during the Cold War, the Research Institute of America produced its own propaganda map to illustrate the spread of what they called the “Communist menace” from Russia to other parts of the world.

Yes, it is impossible to make a flat map that is completely accurate. However, when looking at a

map, it must also be remembered that, for political reasons, some maps, for political reasons, are more, or less, accurate than others.

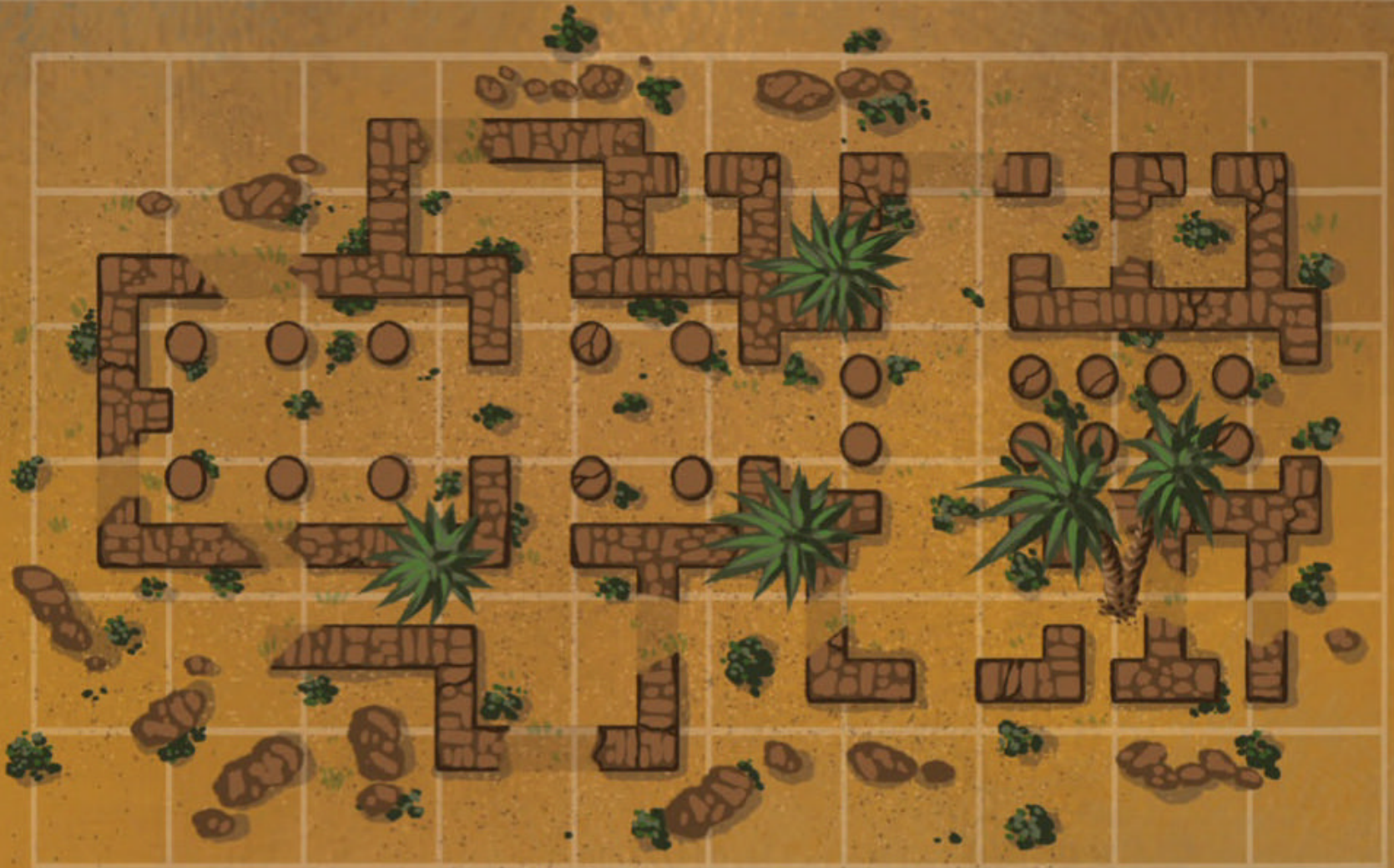
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Regina Hansen is a writer who teaches at Boston University.

The Winkle Tripel Projection tries to find a happy medium between projections.



Map an Archaeological Site

You are the archaeological surveyor! You'll need a pencil and maybe a ruler. Use the grid around the site at the top of the page to help you copy it as an archaeological plan on to the grid below. Only draw the walls and columns of the building—not the rubble or the plants. Use dashed lines where walls have crumbled away, or where you can't make out details because of trees. We've started a plan for you at the bottom of the page.



Digging Deep

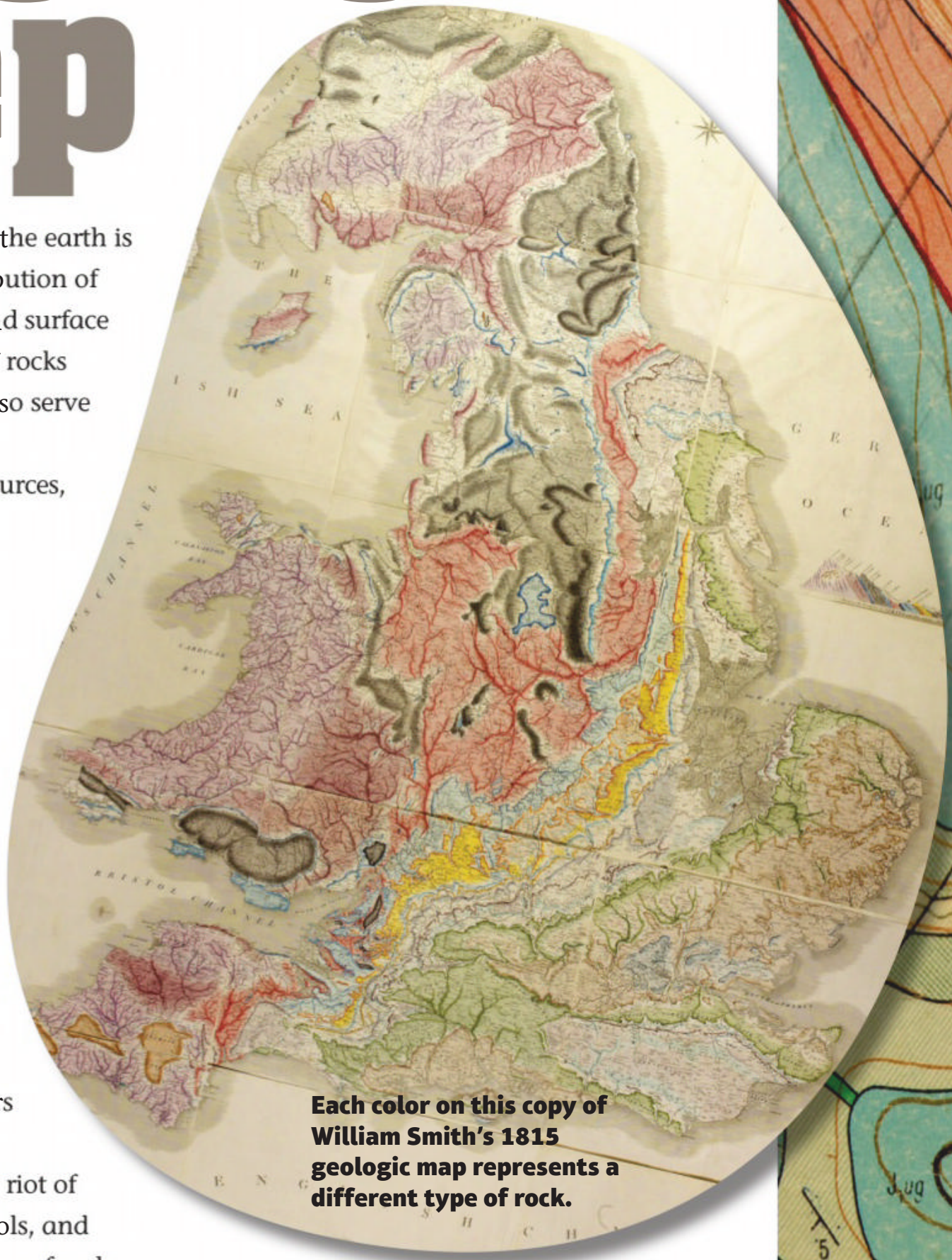
by Bert Fisher

Geologic maps show how the earth is constructed — the distribution of various types of rocks and surface deposits, as well as the location of rocks that are broken and bent. They also serve as tools that help scientists solve problems that involve earth's resources, hazards, and environments. For example, they help answer such questions as: Is a location safe for buildings or highways? Is an area subject to landslides? Where can one mine useful minerals? Is groundwater available in a specific spot?

Geologic maps offer a great deal of information in a small space. Typically, geologic data are printed over more familiar maps, called base maps, that show topography, streams, roads, and towns. Because different colors are used to represent the various types of rock, geologic maps are a riot of color. Various codes, special symbols, and line styles are used to show the ages of rocks and where they are broken, bent, or tilted. As a result, mapmakers can show four dimensions of data — three spatial dimensions plus time.

The oldest known geologic map is the Egyptian Turin papyrus (see pages 4–5). Like modern geologic maps, the Turin papyrus uses

color to show the locations of different rocks and sediments. Like the Turin papyrus, many early geologic maps focused on the locations of mines and rock outcrops. The types of rocks and structures that might lie between or beneath these isolated sites were





This group of mapping geologists is inspecting an exposed cliff face to see which minerals they can spot.



Core samples tell mapmakers and geologists which types of rock are in a given area.

FUN FACT!

William Smith and Jane Austen, the author of the novel *Pride and Prejudice*, may have exchanged greetings. Both lived in Bath, England at the same time in the early 19th century — Austen from 1799 to 1806 and Smith from 1802 to 1805.



considered unknowable. Consequently, early naturalists produced detailed descriptions and maps of individual rock outcrops. Few, however, noted any connection between sites with similar rocks.

A breakthrough came in 1757, when an unknown naval cartographer created the first modern geologic map. Based on limited surface observations, this map used geologic reasoning to extend boundaries between four different rock types on the island of Heligoland in the North Sea.

The early 19th century was a time of large-scale geologic mapping. In 1807, Scottish immigrant William Maclure began collecting data for the first geologic map of the United States. During Maclure's two years of field work, he crossed the Appalachian Mountains 50 times! The map he published in 1809 showed only five rock types, but it spanned the eastern coast from Maine to Florida.

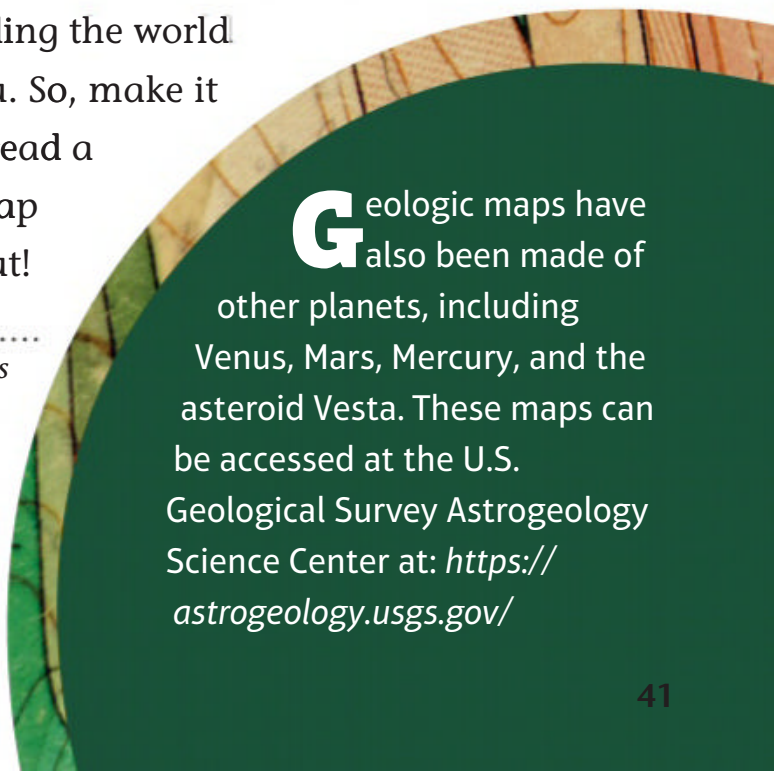
English geologist William Smith created the first geologic map of Great Britain in 1815. It was the first detailed geologic map of an entire country and the first map to rely on fossils to correlate rock outcrops. The map was revolutionary for two reasons: First, it was based on widespread and highly detailed data from Smith's work as a canal and mine surveyor. Second, he used fossil content to correlate rock units between outcrops. Earlier maps had organized rocks on sometimes

unreliable properties such as color or chemistry. Expensive to produce, the map did not sell

well and landed Smith in debtor's prison for nearly two years. Eventually, Smith's contributions to geology were recognized. In 1831, he was awarded the Wollaston Medal by the Geological Society of London. In 2001, his work was widely popularized by Simon Winchester's *The Map That Changed the World: William Smith and the Birth of Modern Geology*, a nonfiction best-seller.

Geologic maps are more accessible now than ever. No dusty libraries needed! For a geological survey of the United States, go to www.stategeologists.org. Many geologic maps are now interactive electronic documents that offer answers to complex questions about planet Earth and its people. Just remember — understanding what is beneath your feet is essential to understanding the world around you. So, make it a point to read a geologic map and find out!

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Bert Fisher is a geoscience consultant and collegiate educator based in Tulsa, Oklahoma.



Geologic maps have also been made of other planets, including Venus, Mars, Mercury, and the asteroid Vesta. These maps can be accessed at the U.S. Geological Survey Astrogeology Science Center at: <https://astrogeology.usgs.gov/>

What Is

by Albert Garcia

GIS?



Cartography has come a long way since the days of painting hunting grounds on cave walls and scratching diagrams of villages onto clay tablets. Today, more than 750 navigation and observational satellites orbit the earth, tracking incredible amounts of geographic information: changing coastlines and waterways, forests and vegetation, urban sprawl and the effects of drought and pollution, and much more.

Meanwhile, down on earth, those satellites help cartographers accurately map topographical features and locations with Global Positioning Systems (GPS). This information, in turn, provides exact longitude, latitude, and altitude coordinates. Airplanes and drones also photograph and record the land and sea from above.

COMPUTERIZED GEOGRAPHY

Mapping all of this information, however, can be difficult. With too many features, a map can become so densely cluttered that it is difficult to view every detail.

To solve this problem, GIS (Geographic Information Systems) programs were developed in the early 1960s. Combining computer technology with mapmaking, GIS is a valuable tool in cartography. It is also used in other industries and sciences, including urban planning, disaster preparation, agriculture, civil engineering, and archaeology.

With GIS programs, users can view as much (or as little) information on a map as needed. Features such as rivers, land areas, city boundaries,



Technologies like drones and 360-degree cameras help gather the data that GIS programs need.

vegetation, and population groups — anything that can be mapped! — are each plotted on separate digitized layers that can be turned on and off. This feature makes it much easier to identify changes or relationships that may not be visible otherwise.

MAPPING AN EPIDEMIC

The principles of GIS began as a helpful response to a tragic situation. In 1854, a cholera outbreak in London, England, was responsible for the deaths of hundreds of people. At the time, doctors and scientists believed cholera was an airborne disease. A doctor named John Snow disagreed.

Snow had some experience in researching cholera. He believed it would be useful to create a map that marked the locations of local outbreaks and deaths. When he did so, he noted that a street corner with a well that was commonly used for drinking water was close to



Contaminated water from a street pump like this one was the culprit in London's lethal cholera outbreak.

the marked sites. The epidemic ended shortly after Snow convinced city officials to remove the handle for the well pump, making the water inaccessible.

A NEW ERA IN CARTOGRAPHY

Soon, cartographers and scientists began plotting data on glass and clear plastic overlays. These could be placed on top of maps to compare natural features and human activity, much as Snow's map had done.

Computer technology was the next big step in cartography. In 1960, geographer Roger Tomlinson digitized map layers for the Canada Land Inventory and linked them to a database. This innovation became the Canadian Geographic Information System and the origin of today's GIS.

MAPPING THE FUTURE

Just as the science of cartography has advanced significantly in recent decades, GIS has as well — although in a much shorter time. Importantly, GIS allows people who are not well versed in cartography to create and analyze maps. Easily accessed internet-based programs do the same. In

addition, many colleges and universities are now offering degrees in GIS science.

Faster and more powerful computers and programs are constantly increasing GIS capabilities. With GIS, we can view searchable maps on the internet and smartphones, finding routes, distances, traffic congestion, or nearby restaurants in a matter of moments.

Yes, it is true that GIS is a much easier method of finding your way around than clay tablets and large paper maps. But, those ancient guides certainly helped us find our way to GIS.

WHAT'S IN A NAME

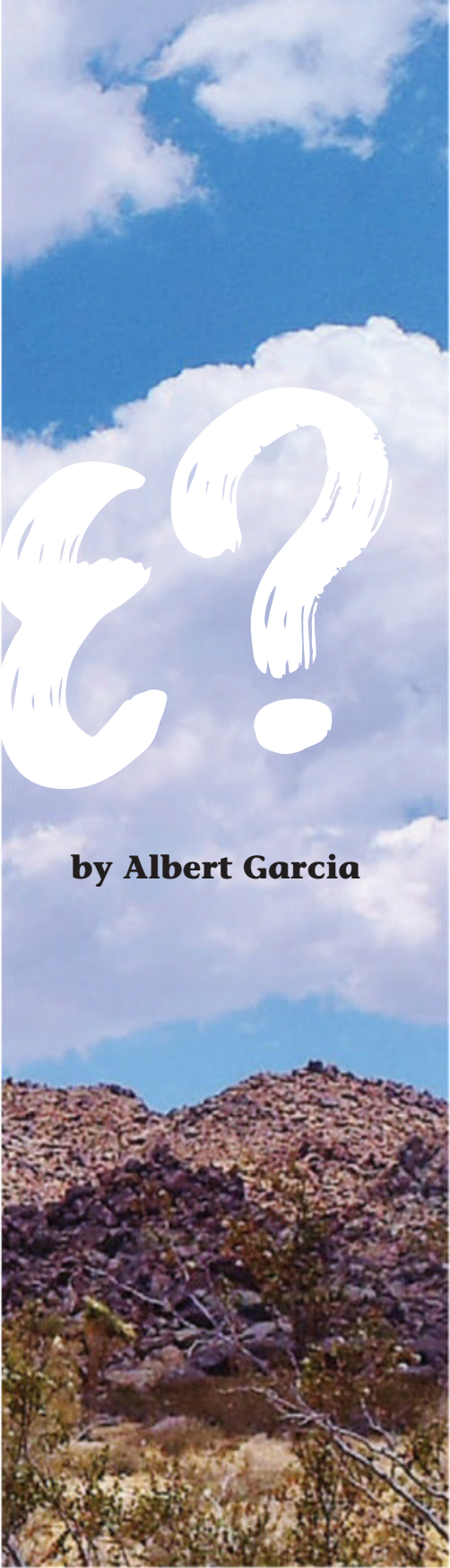


As the United States continued its western expansion in the 1800s, surveyors and cartographers were given plenty of new information for their maps. However, there was no standard procedure for naming geographic features. Mountains, canyons, and bodies of water were often given different names or spellings, confusing mapmakers and anyone relying on these maps to navigate the vast new territories.

To address this situation, President Benjamin Harrison established the U.S. Board on

Geographic Names (BGN) in 1890. This agency was granted the authority to create a directory that would solve “all unsettled questions concerning geographic names.”

Following World War II, the BGN began to include places of interest that lay beyond the borders of the United States. In 1947, BGN’s mission was updated and enacted as public law. The usefulness of a standardized method of naming geographical features has now been implemented by more than 50 other nations, many of which work directly with the BGN.



by **Albert Garcia**



The U.S. Geological Survey keeps very accurate maps of the entire country. In that purple circle is the newly named Cerro de la Silla!

A LENGTHY ROLL CALL

Based in Washington, D.C., BGN consists of members of various federal agencies. This team is tasked with the oversight of America's public lands and geographical and population data. The members work with the U.S. Geological Survey to manage the Geographic Names Information System (GNIS). The latter is a database that features more than two million sites throughout the United States and its territories.

Serving the public and the federal government, the BGN is the authority on name changes, inquiries, and conflicts. It also accepts proposals for new names through the Domestic Geographic Name Proposal (DGNP), an online application process.

HOW I NAMED A MOUNTAIN

Naming a geological feature requires much research and patience. A name must have some cultural, historic, or personal significance, and its designation must not be opposed by any local residents or groups.

An **arroyo** is a steep-sided gully cut by running water in an arid or semiarid region.

USGS is an acronym for the United States Geological Survey.

My father chose the name Cerro de la Silla (Spanish for "Saddleback Hill") for a mountain in the Mojave Desert near the town of Joshua Tree in California. We searched the GNIS database to make sure that the name had not already been assigned and that historic maps did not show any previous name for the site. We then completed the DGNP form, answering such questions as: Is it a valley, cave, **arroyo**, or something else? What is its shape, elevation, length, or other identifying factors? What are its longitude and latitude coordinates, and in what city, county, and state is it found?

After all the forms were filled out and all supporting documents, maps, and photos provided, the proposal was reviewed at the BGN monthly meeting. After being approved there, it was sent to county officials, the Bureau of Land Management, Native American tribal representatives, and the California Advisory Committee on Geographic Names.

When my proposal was finally approved, I received a congratulatory letter from the Board of Geographic Names with the geographic data related to Cerro de la Silla. The **USGS** National Map now displays this new feature name. The name will also appear on future revisions of topographical maps of the region, and I will be the first to proudly purchase one!

Artist Tom Lopes has incorporated several of the words/expressions highlighted in this section into his illustration. We have labeled one. Can you find others? See page 56 for the answers.

WORD ORIGINS

Explore This term derives almost directly from Latin, but it did enter English through the French derivative of the Latin. The French term *explorer* traces its roots to the Latin *explorare*. The word in both languages translates as “investigating.” So, let’s “investigate” a little more! In Latin, *explorare* is a combination of *ex* (“out”) and *plorare* (“to lament”). You might say that, in Latin, exploring meant going out and complaining about it.

Map In Latin, the term *mappa* means “napkin” or “sheet.” During the Middle Ages, European artists created *mappae mundi*, or “sheets of the world,” for families who could afford such documents. These *mappae* were huge paintings that showed a bird’s-eye view of the Earth, with Europe, Asia, and Africa surrounded by an immense ocean. At the time, the English language formed the word *mapemounde* (“world map”) from the Latin. As the centuries passed, all but the first three letters were dropped.



WORD STORIES

Atlas In Greek mythology, the Titans were very ancient deities, the children of Uranus (Heaven) and Gaia (Earth). They preceded the gods who ruled from Mt. Olympus. Atlas was a Titan who led a rebellion against the gods on Mt. Olympus. As punishment for the rebellion, Zeus forced Atlas to hold up the sky for eternity. When the not-so-mythological

Answer on page 56



German-Flemish mapmaker Gerardus Mercator was compiling one of his books of maps in the 16th century, he called it *Atlas* and used a picture of Atlas holding the world in the opening illustration. Historians are not entirely sure if Mercator is the first person ever to use the word *atlas* for a book of maps, but he is the first recorded person to do so.

EXPRESSION

Here Be Dragons Many early mapmakers used certain phrases to show the boundaries between explored and unexplored regions. Roman and Latin-speaking mapmakers wrote *terra incognita*, (“unknown lands”) or *mare incognitum* (“unknown sea”) in the blank spaces on their maps. Slightly more imaginative Roman mapmakers wrote *Hic sunt leones* (“Here are lions”). The Lenox Globe (held in the New York Public Library) uses an even more fantastical phrase: *Hic sunt dracones* — “Here are dragons!”

WHICH WAY?

The cardinal directions in English (north, south, east, and west) trace their roots to Old German. However, digging a bit deeper, we see that their ancient roots can actually be traced back as far as 2500 B.C.E. At that time, people used phenomena in

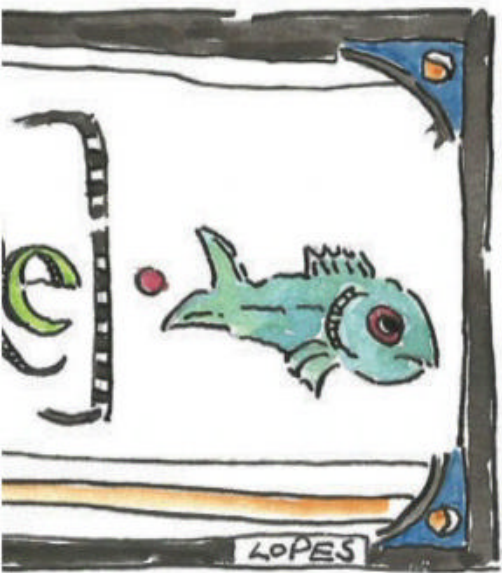
nature to determine the direction in which they were traveling. The constant in this method — no matter where they traveled — was the sun as it made its way across the sky. Thus, it was the perfect tool to distinguish between east and west. Walking north meant turning left when facing the morning sun. To Germanic tribes, walking south meant enjoying increasingly warm and sunny weather.

Take a look now — interesting connections, right?

ENGLISH	OLD GERMAN	MEANING
North	Nord	“Left”
South	Sund	“Sunny land”
East	Ost	“Dawn”
West	Vuest	“Evening”

As the English names of the cardinal directions all trace their origins to very ancient times, it is only natural that the European languages, in turn, can trace their roots to languages spoken in very ancient times, the name of the cardinal directions in many European languages actually look quite similar! Check these out!

ENGLISH	ITALIAN	SPANISH	GERMAN
North	Nord	Norte	Norden
South	Sud	Sur	Süden
East	Est	Este	Osten
West	Ovest	Oeste	Westen



Hint: You’d better make sure you know where your towel is for this rebus!



Water for All

by Sarah Novak

illustrated by Jesse Tise

based on stories from Australian indigenous people

Legends told by the indigenous people of Australia often take place in “Dreamtime,” their mythical world. These ancient stories and songs about the landscape were guides to an invisible map of paths across the land, called “songlines.”

During the Dreamtime, the world was still being created. The land was parched and dry. Water was hard to find.

“We need more water,” said Jiggirrjiggirr, the wagtail.

“I have to chew on *gulbirra* grass for a few drops of moisture,” complained Midin, the possum.

“We will all die of thirst,” predicted Kookaburra, the kingfisher.

“I saw Bangarra the blue-tongue lizard drying off his wet scales. He thought he was hidden but he wasn’t,” said Gudjilla, the bandicoot.

“So Bangarra knows where to find water!” the animals exclaimed. “But he wants to keep it a secret.” They set off to talk to Bangarra.

Gula, a shy rat-kangaroo, joined them. They found Bangarra before he could crawl under a rock.

“Where is the water, Bangarra?” they asked.

“I’m not telling,” answered Bangarra. “Because I’m not sharing.” Then he rudely stuck out his blue tongue at them and scuttled off.

One by one the animals tried to sneak up on Bangarra unseen

and follow him to the water. But the sharp-eyed lizard spotted each one of them and chased them away. Then Gula, the rat-kangaroo, volunteered to try. The other animals laughed at him. “You are too timid, Gula!”

But Gula hopped away over the hot dry earth, jumping so quickly behind stones and *gulbirra* grass that Bangarra never saw him. Gula watched Bangarra go down into a gully and move a big flat rock. Water gushed out, clear and sparkling. Gula longed for a drink of it, but hurried back to the other animals.

He led them to the water and together they chased Bangarra away. They let the water fill up and overflow the gully and refresh the land. Shy Gula had found water for all.



Indigenous artists created images inspired by songlines in 2016 to project on the Sydney Opera House.

A Map Made of Songs

Long before the name “Australia” appeared on any map, the original inhabitants of this island-continent explored and shared the best routes for traveling across their land. But these directions were not mapped out on paper. Instead, for tens of thousands of years, the **indigenous** people of Australia found their way through deserts, forests, mountains, and grasslands with songs. These maps of interconnected songs are called songlines.

The songlines originated in the legends that indigenous communities told about the creation of their world by ancient ancestors. This long-ago but ever-present past is often called the “Dreamtime.” Beings with amazing powers journeyed through the continent during the Dreamtime. They named the land’s plants and animals. They also shaped the features of the landscape. All the land was considered sacred, although rock formations and water sources were especially important. Knowledge of the pathways and landmarks created by the Dreamtime wanderings was handed down for generations through stories and songs. These “dreaming tracks” became the songlines.

The words, melody, and rhythm of the songs showed how to walk through the land. Traditionally, they mapped places to find water and to hunt for food, both essential for survival on a journey in a sometimes harsh environment. Some songlines follow mountain ridges, while some follow valleys. A songline may be just a few

miles in length, or it may lead through long distances. Long songlines can link up indigenous peoples who may speak different languages.

Beginning in the 18th century, settlement in Australia by British colonists disrupted the indigenous way of life. However, in the later 20th century, an increasing interest in the culture of these “first Australians” brought new attention to songline map traditions. **Did you know?** Today, indigenous artists use songline images and stories in vibrant paintings that feature intersecting lines and dots.

Sarah Novak is a writer who explores the less-traveled byways of history and tells tales from folklore and legend.

Indigenous means originating and living in a particular place or community.

How to Get

by Sarah Novak

Check out the map at right. Printed in 1518, it details an island nation. Looks like a nice place! You can see rivers, valleys, mountains, and woods. Big cities and smaller settlements, linked by roads, perch on the coast and spread out in the interior. These urban areas feature impressive castles and gates and towers. Ships and boats come and go. The three men at the bottom of the map, well dressed in **Renaissance** style, are clearly enthusiastic about the place.

A Latin title above the map, "*Utopiae Insulae Tabula*," translates as "map of the island of Utopia." The name "Utopia" derives from the Greek words *topos* ("place") and *ou* ("not"): "No Place." In other words, it doesn't exist! The idea of Utopia was created by Thomas More in 1516 in a book of the same name. An English writer and lawyer, More served as advisor to King Henry VIII. His Utopia was his attempt to imagine an ideal society, where no one was rich and no one was poor, and everyone had

Utopia's capital city Amaurotum ("Mist-town") lies in the center of the map. The three nameplates tell the reader where the three rivers of the island are.



Nowhere



what they needed. Today, the term “utopia” has come to mean a place so perfect that it cannot actually exist.

The Utopia shown here may hold a secret message. Some have seen what is known as a *memento mori* (Latin for “remember that you will die”) — that is, a reminder to live life well. A *memento mori* is often symbolized by a human skull. Can you see one formed by the map?

Now, let’s fast forward to 1699. Somewhere in the Indian Ocean, a storm has just caused a shipwreck. There is one survivor, Lemuel Gulliver. He finds his way to land and collapses on the shore. When he awakes, he is surrounded by thousands of people — each six inches tall. He becomes their prisoner on the island of Lilliput and observes their bitter arguments about how to eat an egg and the proper height of their shoes’ heels. Finally, he escapes to the nearby island of Blefuscu. Further travels take him to far-off lands where he encounters giants, a flying island, talking horses, and much more.

A book by Gulliver about his adventures, *Travels into Several Remote Nations of the World*, was first published in 1726 and became known as *Gulliver’s Travels*. However, Lemuel Gulliver and his explorations were completely made up. The author was actually Jonathan Swift (1667–1745), a writer and clergyman who lived in England and Ireland. Like Thomas More two centuries earlier,

Swift questioned the social problems of his day, such as political and religious conflicts, by setting them in imaginary places.

In the pages of *Gulliver’s Travels*, Swift’s imagined countries were drawn on maps of the real world. The islands Lilliput and Blefuscu were placed in the Indian Ocean, southwest of Sumatra, as shown in the map at left. (Australia is missing here and replaced by “Damens Land,” today’s Tasmania.)

Gulliver’s Travels was frequently reprinted, sometimes with new versions of the original maps. The version below is from 1912. However, the map has mistakes. The date of the voyage is given as 1609, not 1699. And the Straits of Sunda are labeled Straits of Sunday!

Lilliput and Blefuscu



There's Something Funny Going On...

by Marina Debattista

Lewis Carroll
liked to invent
funny solutions
to impossible
problems.



Have you ever been confused by the many lines, signs, and symbols that adorn maps? Have you ever been mystified by parallels and meridian lines, and struggled to remember which are which? Then you may be in good company. None other than Lewis Carroll, the author of *Alice in Wonderland*, captured the bewilderment some maps may cause. Carroll imagined the “best map” as one that is perfectly blank! His empty map is featured in a nonsensical poem titled *The Hunting of the Snark*. The tale relates a sailing ship’s doomed chase to catch a creature called the Snark.

The story starts with the crew assembled and prepared to go on the hunt under the Bellman’s command. When readying their vessel, the crew members admit that they find regular maps difficult to read. Echoing the frustration with maps that many of us experience, the Bellman cries,

*What’s the good of Mercator’s North Poles
and Equators,
Tropics, Zones, and Meridian Lines?*

At last the Bellman finds one that the entire crew is pleased to find they can all understand: the perfect map, one that shows the sea, with “no vestige of land” on it. The crew soon discovers that the “brave” Captain’s navigation skills match the absurd empty map he bought for them. They also realize

*That the Captain they trusted so well
had only one notion for crossing the ocean,
and that was to tingle his bell.*



But if (in the Bellman’s view) a perfect map is one that omits all details and offers only an absolutely blank paper, what will be a map that includes every detail of a country? Carroll, who was a mathematician and academic at Oxford University, amused himself by discovering various ways to distort common sense. He included in his tale titled *Sylvie and Bruno Concluded* a map that challenged the assumption that a more detailed map is necessarily more exact and therefore more useful. To capture every detail in the country to be represented,

such a map would have to be very large. But what would be the appropriate size? Carroll concluded that such a map had to be as large as the country itself. But such a map would never be used, because “the farmers objected: They said it would cover the whole country, and shut out the sunlight!” So, instead of the cumbersome map, the country itself was used, which, “I assure you does nearly as well.”

These two whimsical maps imagined by Carroll illustrate, in a humorous way, a paradoxical situation in which an empty map is considered “perfect,” while the most accurate map (at “the scale of a mile to the mile”) is, in fact, totally useless. These examples highlight how real maps must juggle accuracy and usefulness. They also prove that the “conventional signs” decried by the crew in *The Hunting of the Snark* are, after all, necessary for a better representation.

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Marina Debattista is a part-time tutor in the Department for Continuing Education at the University of Oxford.

Q What are the most common artifacts found on a dig? Why?
—Pete, Web post

A HI PETE! Human beings long ago had the same needs and habits they do today. Archaeologists investigate the places where people lived and worked, and they uncover what people left behind. For this reason, many of the biggest artifact finds on any archaeological dig tend to be garbage. Looking more closely at garbage, a great part of it is the containers people used, usually until they broke and were thrown away. These containers were usually made of baked clay, so most excavations collect this pottery. One large artifact class is bones, shells, and antlers; often the remains of meals. Another large class is stone tools. Stone survives very well in the archaeological record, and human beings have always made tools for themselves. Tools were surely made of other materials, but the stone elements are usually the components that survive.

—Calliope



Q What's the Norman Conquest? I read that it happened in England?
—Michael, Web post

A HI MICHAEL! In the mid-11th century, Edward the Confessor was the king of England, and he had no children. Therefore, he promised his throne to Harold Godwinson, earl of Wessex. Both men were Anglo Saxons, a people who ruled England in the early Middle Ages. However, according to William the Duke of Normandy, Harold had sworn that he would support William as the heir. William was Norman, a people who had originally come from Scandinavia to settle in Normandy on the northern coast of France. When Edward died, Harold took the throne. William invaded Britain and, on October 14, 1066, in a battle in a place called Hastings, William won the day — and England. Since then, he has been referred to as William the Conqueror.

—Dr. Dig



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The Lost Treasure Map

by Sarah Novak

The pouring rain would not let up. Day after day, 13-year-old Lloyd Osborne and his family were stuck inside their cottage in Scotland. Lloyd's summer vacation of 1881 promised to be the worst ever.

But Lloyd decided to make the best of it. He found some paper and ink and paints. A room in the cottage became an art gallery for his pictures. His stepfather, writer Robert Louis Stevenson, admired Lloyd's artwork. Stevenson was inspired to draw something himself. So, he made a map of an imaginary island. Then he thought about what might happen on the island. What if pirates came? What if they hid stolen treasure there? What if one of the pirates had a wooden leg? And a parrot that perched on his shoulder? What if a boy — like Lloyd — got mixed up in the adventure? Stevenson labeled the map "Treasure Island."

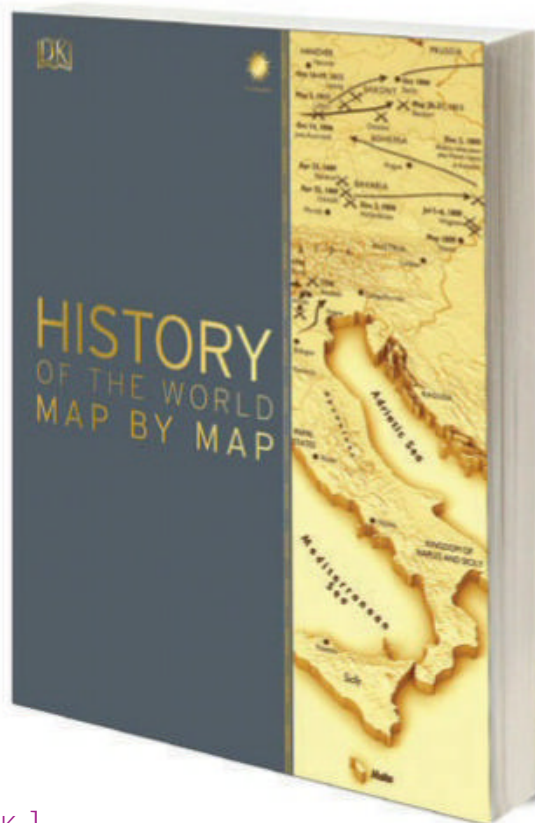
Before long, Stevenson had thought up a story based on his map. He wrote 15 chapters in two weeks. He read them aloud to his family every afternoon. A friend stopped by and heard some of the pirate adventure. He liked it so much that he suggested the story should be printed in a children's magazine, a new section in every issue. (In those days, novels often first



The map above is a redrawn version of Stevenson's original, which was inspired by his son's artwork.

appeared chapter by chapter in magazines and newspapers before being printed as a book.) Readers loved the story. *Treasure Island* was Stevenson's first big success. It became one of the most popular adventure tales ever written.

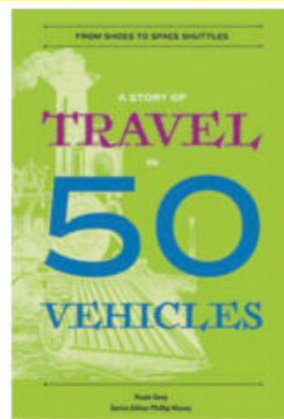
Later Stevenson sent his publisher a final version of the story, along with his map, to be made into a book. But somehow his map was lost! So Stevenson had to make a new one, shown here. But, he said, he always liked his first one the best.



[BOOK]

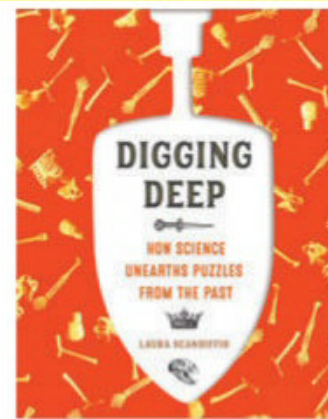
A Guide to History

Smithsonian: History of the World Map by Map, by DK (DK, 2018, www.dk.com) includes more than 140 maps — from the earliest migrations out of Africa to the modern-day space race. This is sure to expand and enhance your understanding of world geography, as well as world history. Definitely a must as a reference book!



[BOOK]

A Story of Travel in 50 Vehicles (From Shoes to Space Shuttles), by Paula Grey (Tilbury House, 2016, www.tilburyhouse.com) lives up to its title and more! A fascinating read, it is one of four in a series that focuses on telling the story of travel, medicine, civilization, and ambition through 50 discoveries, disasters, and hoaxes — respectively. Well-researched text, excellent complementary photos, and pertinent sidebars and boxes make all four perfect candidates for the “most-used” spot on your bookshelf!



[BOOK]

Digging Deep: How Science Unearths Puzzles From the Past, by Laura Scandiffio (Annick, 2019, www.annickpress.com) follows researchers as they uncover and analyze such finds as Otzi the Iceman, sunken ships in the Arctic, the grave of Richard III, the art in the Chauvet Cev, and much more. A captivating, informative, and well-illustrated read!

Answers

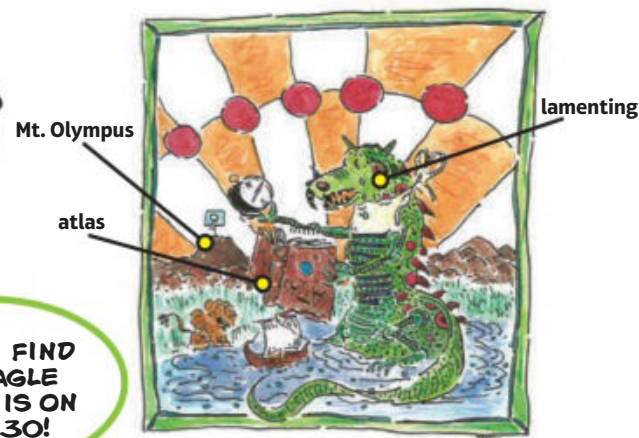
Answers: Fun with Words, pg 46



Sew Lungs and Tanks four Awl the Fish

So long and thanks for all the fish
The last issue goodbye from
Hitchhiker's Guide to the Galaxy

Answers: Fun with Words, page 46



A **lamenting** (crying) dragon holding an **atlas** checks his compass. He sits in an unknown sea while a lion watches from shore. Above, the sun makes its way across the sky. The dragon wears a napkin and in the distance is **Mt. Olympus**.



Bedolina Map

During the early 1900s, in the valley of Valcamonica high in the Italian Alps, archaeologists uncovered one of the world's oldest maps. Known as the Bedolina map, it is a petroglyph: an image carved into the surface of a rock. Some 150,000 other prehistoric petroglyphs of warriors, hunters, suns, and animals dot Valcamonica. Yet the Bedolina map's geometrical patterns of lines and squares that resemble paths, streams, and fields make it unique among the valley's many petroglyphs.

Ancient craftsmen probably created the map over a period of several thousand years, ending in about 1,000 B.C.E. They cut the map into the glacier-smoothed surface of a large sandstone slab on Valcamonica's western slope. The oldest images

on the slab were carved with simple flint or quartz tools. Later images were etched with more advanced tools made from iron or other metals. The engraved portion of the stone is about 15 feet high by 7.5 feet wide. Included are pictures of houses and livestock, a network of zigzagging lines thought to represent local waterways and roads, and about 30 dotted squares that are thought to be farm fields.

The creators of the Bedolina petroglyph may have meant their artwork to be more than a record of the local landscape. Some archaeologists believe it includes a number of sacred symbols that were intended to win the good favor of the gods. For instance, the carefully spaced dots that fill the map's square fields may be symbolic offerings to the gods in exchange for bountiful harvests.

— Louise Chipley Slavicek

